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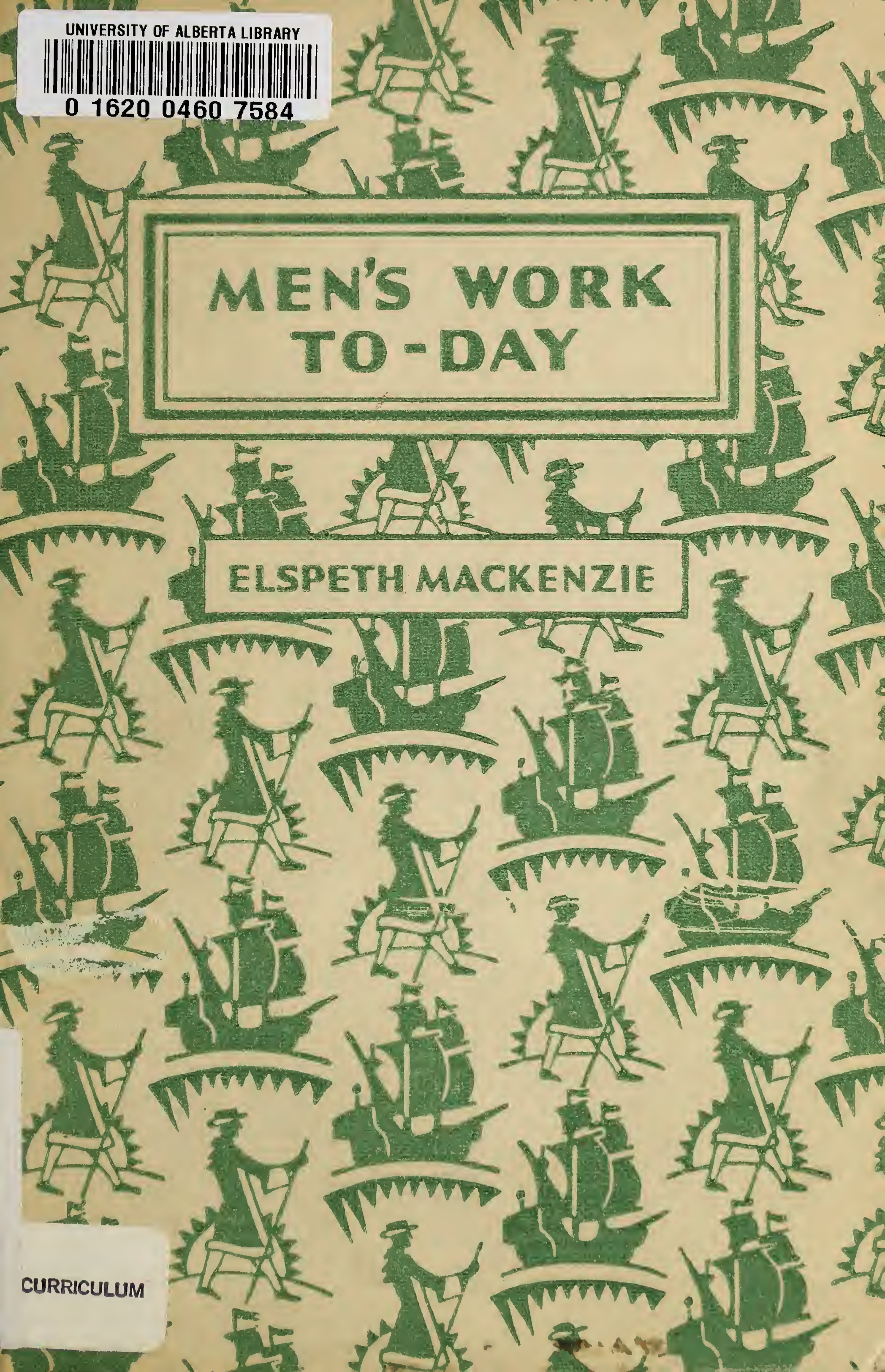

MEN'S WORK TO-DAY

ELSPETH MACKENZIE

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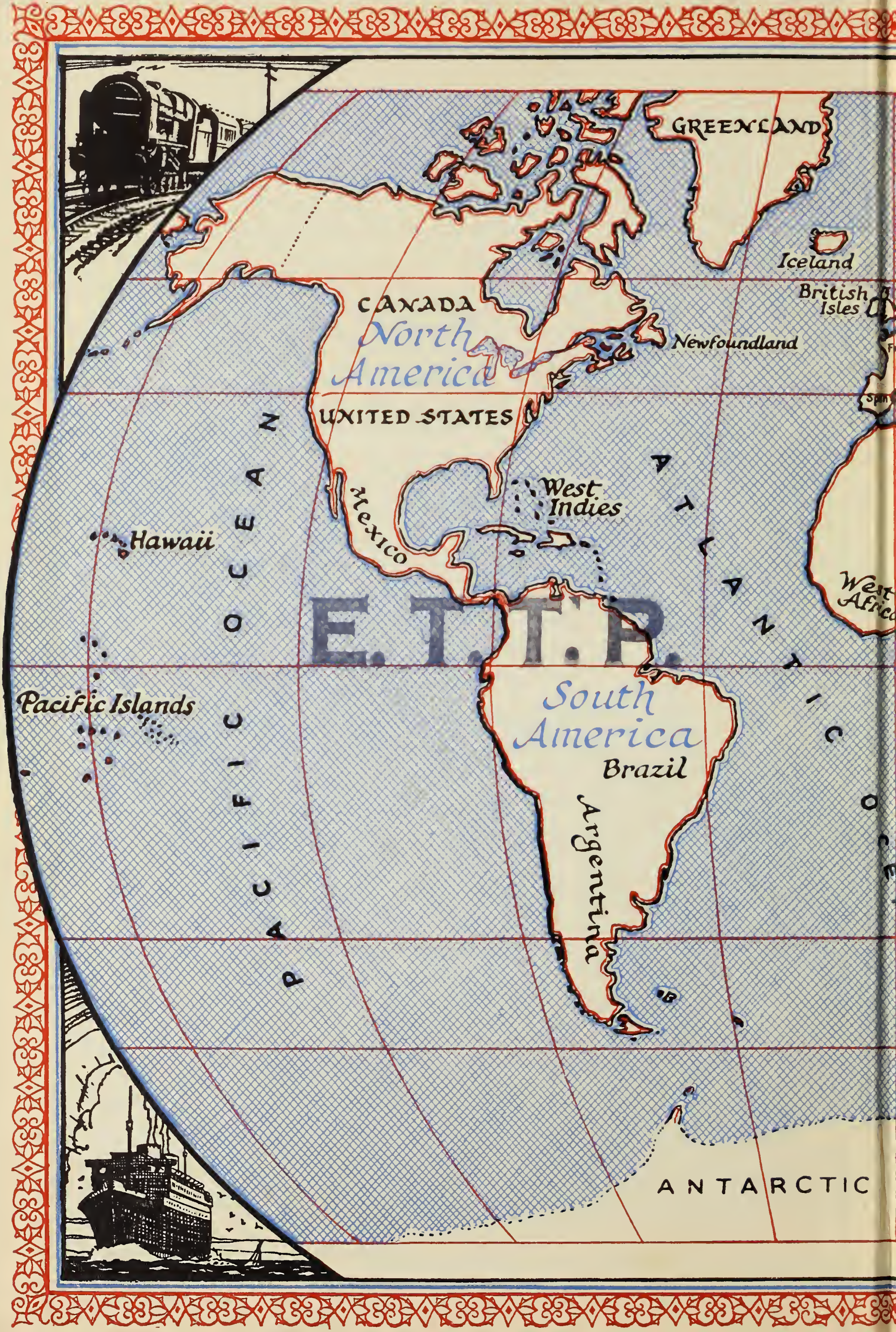
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THE WORLD IN WHICH MEN WORK

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LIFE IN MANY LANDS-III

MEN'S WORK TO-DAY

First published . . 1935
Reprinted . . March 1936
Reprinted . . April 1938
Reprinted . . August 1942
Reprinted . . January 1944
Reprinted . . January 1946
Reprinted . . October 1946
Reprinted . . November 1947
Reprinted . . January 1949

Made and printed in Great Britain by
The Aberdeen University Press

LIFE IN MANY LANDS

III

MEN'S WORK TO-DAY

ELSPETH MACKENZIE

JAMES NISBET & CO. LTD.
22 BERNERS STREET, LONDON, W.1

PREFACE

IN the modern world it is a very striking and very true fact that countless everyday familiar things vary surprisingly little from one country to another. We find people using the same brand of tomato sauce in New York and Peking, in Cape Town and in Vienna.

The cut and shape of clothes, wherever folk no longer wear their distinctive national costumes (and that is almost everywhere) is dictated, for men and women alike, by London, Paris, Vienna and New York. Even Turkey has abandoned its oriental separateness for the bowler hat.

The fact is striking, and cuts far deeper than the superficialities of bowler hats and sauces. In very truth the world is becoming more and more alike, no matter where we turn. The shrinking of the world which we take as a commonplace in these days, when we may speak or write to the Antipodes as though they were the Scotland of little more than a hundred years ago, is very real indeed. It means that men and women, in many distant and different lands, have a great many features of similarity in their daily lives.

Of course, the basic, essential features of difference and distinction—the features of climate and race and national product—persist, as they must always persist. It is these first essentials of any introduction to geography which the two earlier volumes of this series, LIFE IN OTHER HOMES and WORK IN OTHER LANDS, have pictured.

The purpose of this third book, MEN'S WORK TO-DAY, is to complete an introduction to the geography of the modern world by describing, in the way of geographical knowledge, some of those things which are common and general to the life of the world as a whole. It is these very things which, essential and all-important as they are, we are too often apt to overlook because of their familiarity and because an educated adult is in the habit of taking them for granted.

Yet it is a most essential part of a child's introduction to geography that, for instance, he should realise the universality of the motor-car—the fact that ships penetrate to the farthest and remotest coasts of the world—and that there is hardly a country which has not its network of railways.

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From these things which are common to almost the whole world, simple as they are, arises the greater part of men's work to-day. It is not possible to achieve an understanding of the world as it is in our modern civilization without a knowledge of them. And that knowledge it is the purpose of MEN'S WORK TO-DAY to give.

The story of many of these industries and activities has all the fascination and interest of ' how it works ' and ' how it is made ' —and every one of them has, by its very nature, the convincing sincerity and reality that can come only from the closest and most familiar touch with everyday life.

Each chapter deals with a subject of world-wide importance. Each subject is described as a common essential of civilized life—and each, as is the way of this series, is represented by a picture-sequence as well as the text. The subject of each picture is noted *at the foot of the page*, for each illustration is a representation of the text, and should be associated with it as closely as possible.

In most cases the work described is truly world-wide and universal, but in certain cases (coal, shipbuilding, oil, etc.), where the work, though world-wide in its effect, is yet localised to a certain extent, special maps showing the world-distribution are included. Throughout, there are exercises designed to aid and drive home the purpose and the ideal of the book's work.

MEN'S WORK TO-DAY is greatly indebted to the understanding co-operation and expert knowledge of the artists who have illustrated it. The assistance of firms representing the branches of industry concerned has been most helpful : and the author is especially grateful to The Aberdeen University Press, Messrs. John Dickinson, The Pelican Press, and The Anglo-Iranian Oil Company. The help given by E. N. A., Messrs. Joseph Lyons, Messrs. Selfridges, General Motors (Vauxhall Motors), Messrs. Josiah Wedgwood, The Electrical Development Association, *The Times*, and Topical Press has been most valuable.

Understanding of the distinctive modern educational purpose of this book has been enthusiastically shown by all who have collaborated in its making, and notably by Mr. F. D. M. Harding. The author hopes that its results may reflect the sincere conviction of its value and importance that have gone to its design, writing and production.

E. M.

149944

CONTENTS

MAP - THE WORLD IN WHICH MEN WORK *Front End Paper*

PAGE

HOW THE WORLD WORKS 11

Illustrated by NORMAN HOWARD

FOOD 21

Illustrated by W. W. LENDON

TEXTILES * 31

Illustrated by W. W. LENDON

BUILDING 41

Illustrated by NORMAN HOWARD

POTTERY AND GLASS * 51

Illustrated by W. W. LENDON

PAPER AND PRINTING 61

Illustrated by NORMAN HOWARD

COAL * 71

Illustrated by T. POULTON

IRON AND STEEL * 81

Illustrated by EVAN MACDONALD

SHIPBUILDING * 91

Illustrated by NORMAN HOWARD

PAGE

ELECTRICITY 101

Illustrated by W. W. Lendon

RAILWAYS 111

Illustrated by Norman Howard

OIL * 121

Illustrated by W. W. Lendon

MOTOR CARS AND ENGINES * 131

Illustrated by Norman Howard

THE MAKING OF ROADS 141

Illustrated by Norman Howard

WORKING TOGETHER 151

Illustrated by Norman Howard *and* W. W. Lendon

EXERCISES

MAP - THE WAY MEN WORK TO-DAY *Back End Paper*

* *These chapters have special maps to show the world-distribution of the industries described. (The other chapters are concerned with industries which are world-wide.)*

Each chapter is followed by Exercises—
including Picture Study and Practical
—on the subject of that chapter

ILLUSTRATIONS

PAGE

HOW THE WORLD WORKS

A Great Liner at Cape Town . 10
The Wheat Harvest . . . 12
Loading Railway Trucks . . 13
Cargo Boat, Tug, and Lighters 14
International Express and Mountain Railway (Montreux, Switzerland) 15
Modern Building and Traffic (Italy) 16
The Work of the Kitchen . . 17
In a Modern Shop (*Courtesy Messrs. Selfridges*) . . . 19

FOOD

Ploughing with Oxen (*E. N. A.*) 20
Shipping Frozen Meat (The Argentine) . . . 22
Bread at the Start of its Journey through a Modern Oven . 23
A Continental Confectioner (Austria) 24
Preparing Salmon for Tinning 25
Unloading Food from a Ship . 26
A Grocer's Shop . . . 27
In a Modern Restaurant (*Courtesy Messrs. Joseph Lyons*) . . 29

TEXTILES

Map 30
Packing and Pressing Wool (Australia) 32
Spinning Cotton . . . 33
Weaving on a Loom . . 34
Winding Artificial Silk . . 35
Steeping Flax (Ireland) . . 36
Carpet Weaving . . . 37
Textiles in a Shop (*Courtesy Messrs. Selfridges*) . . . 39

BUILDING

Buildings beside a Wharf (*Courtesy Electrical Development Association*) 40
A Large Brickworks . . . 42
A Stone Quarry . . . 43
Building in Steel and Concrete . 44
PAGE
A Large Building . . . 45
Roofing a House . . . 46
Plasterers at Work . . . 47

POTTERY AND GLASS

Map 50
Unloading Clay from Barges into the Claypits . . . 52
Digging Clay from a Claypit . 53
Packing Clay Dishes and Filling the Oven Before Firing . 54
Painting the China . . . 55
Blowing Glass 56
Cutting Plate Glass into Sheets . 57
The Potter's Wheel — The 'Thrower' at Work (*Courtesy Messrs. Josiah Wedgwood*) . 59

PAPER AND PRINTING

One of the Machines on which this Book was Printed (*Courtesy The Aberdeen University Press*) . 60
Beating the Pulp in a Beating Machine 62
The Pulp Becomes Paper—the 'Wet End' of the Machine . 63
The Paper is Dried and Hardened —the 'Dry End' . . . 64
Cutting the Reel of Paper into Sheets 65
The Machine which Makes the Type 66
Lifting the Type from the Printing Machine . . . 67

COAL

Map 70
The Pit Head 72
At the Bottom of the Shaft . 73
Winning the Coal from the Face of the Seam 74
Fixing Pit Props . . . 75
Sorting the Coal . . . 76
Unloading Coal Trucks . . 77

PAGE

IRON AND STEEL

Map 80
An Ironworks 82
Pouring the Smelted Iron into Moulds 83
Pouring Steel from a Furnace . 84
A Steam Hammer at Work . 85
Rolling a Girder 86
Riveting the Framework of a Building 87
Riveting a Railway Engine's Firebox (*Topical Press*) . 89

SHIPBUILDING

Map 90
The Ship's Keel being Built . 92
The Building of the Ribs . . 93
The Ship Glides Down the Ways 94
Lifting Some of the Ship's Engines Aboard . . . 95
A Big Liner in Dry Dock . . 96
A Great Liner at the Quayside 97
The Launch of a Great Ship (*Topical Press*) . . . 99

ELECTRICITY

An Electric Refrigerator (*Courtesy Electrical Development Association*) 100
Dynamos in the Hall of a Power Station 102
Coal Arriving at a Power Station (London) 103
The Dam and Pipe Lines . . 104
Pipe Lines and Power Station . 105
The Driver's Cab of an Electric Train (England) . . . 106
The International Telephone Exchange (London) . . 107

RAILWAYS

The Blue Train near Monte Carlo 110
The Sudan Express . . . 112
A London Tube Train . . 113
The Cheltenham Flyer . . 114
The Twentieth Century Limited 115
A Dock-Side Goods Yard . . 116
An American Goods or 'Freight' Train 117

PAGE

OIL

Map 120
Building a Pipe Line to carry Oil 122
Oil Wells in an Oilfield . . 123
The End of the Pipe Line—Loading an Oil Tanker . 124
An Oil Refinery 125
Filling the Tank of a Motor-Car (South America) . . . 126
Pumping Oil on Board a Big Ship 127
An Oil Tanker (*Courtesy Anglo-Iranian Oil Company*) . . 129

MOTOR CARS AND ENGINES

Map 130
Building Motor Car Engines . 132
Fitting the Body to the Chassis . 133
The Bus across the Desert from Bagdad to Damascus . . 134
A Giant Signpost (near Fez, Morocco) 135
An Airport (England) . . 136
Refuelling an Air Liner (Imperial Airways) 137
Fitting Engines in Aeroplanes (*Topical Press*) . . . 139

THE MAKING OF ROADS

The Building of Sydney Harbour Bridge (Australia) (*Topical Press*) 140
A Mountain Road (Switzerland) 142
Digging and Levelling a New Road 143
Finishing and Rolling the Road 144
A Lock on a Great Ship Canal (America) 145
Building a Railway (America) 146
A Signpost of the Sea—The Ambrose Light, New York . 147

WORKING TOGETHER

The Work of an Office – a Modern Bank (*Photograph, The Times*) . 150
Carrying Goods on Camels' Backs 152
A Bullock Cart . . . 153
Unloading Paper from a Motor Lorry 154
Loading a Railway Train . . 155
The Loading of a Ship . . 157
Loading an Air Liner (America) 159

NORMAN HOWARD

HOW THE WORLD WORKS

THERE are many different countries in the world. Some are very hot, and have heavy rain only once or twice a year. Some are very cold, with ice and snow nearly all the year round, a winter when the sun never rises, and a summer when the sun never sets.

Other countries, like Britain, are never too hot and never too cold, have sunrise and sunset every day in the year, and are seldom short of rain.

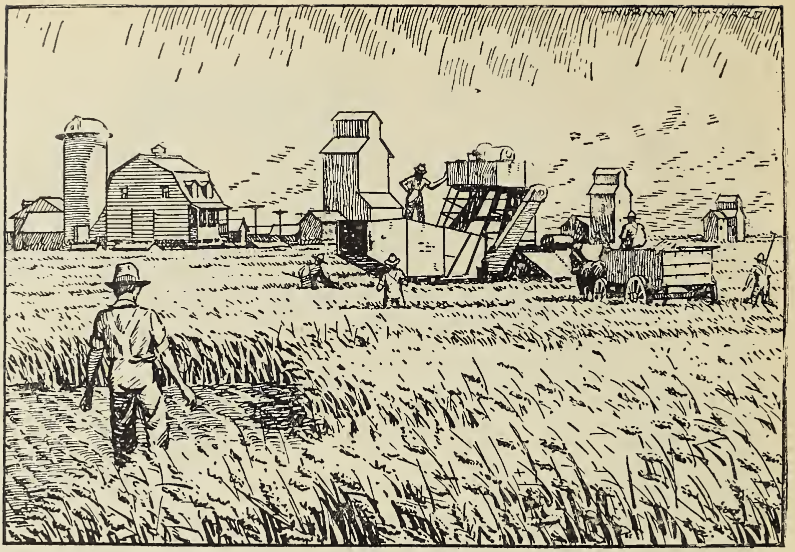
There are different people living in all these countries—white people, black people, red people and yellow people. In hot countries they wear very few clothes, and in very cold places they often wear heavy furs.

The people in hot countries live in very simple houses or huts, but the people of colder countries have to build warm houses with places in them for fires.

All these people have different work to do. In every country food has to be found or grown, and then prepared and cooked: and the food which grows in one country is often quite unlike the food in another.

In Canada wheat grows well, and many men work at ploughing, and sowing and reaping corn. In the Argentine there are vast plains with great herds of cattle. In Australia and New Zealand sheep graze on the pastures of the rolling downs. In India and China tea and rice grow well.

All these are things which we use for food and drink. The people of the countries where each grows best



work at producing enough of it to send some to those other countries which have very little, or none at all.

Canada grows wheat, but needs tinplate. Britain buys the wheat and sends tinplate in exchange. The Argentine produces beef, but needs coal. Britain buys the beef and sells coal in return.

There are many other kinds of work done in the world besides growing food. There is the making of cloth and clothes. There is the making of cups and saucers, plates and dishes, knives and forks, chairs and tables, and all the things we use or see about us.

There is the building of houses, and the making of bricks and tiles, floors and doors and windows. And there is, of course, the producing of all the raw materials which are used, the cotton, silk and wool, the clay, the steel, the timber and the glass.

Food is grown in almost every land, but certain kinds of food grow better in some countries than in others.

Illustration—The wheat harvest (Canada).

In the same way, certain kinds of work can be done in almost every country, but they are done better and cheaper in some countries than in others.

Each part of the world grows the food, makes the goods, and does the work it can do best.

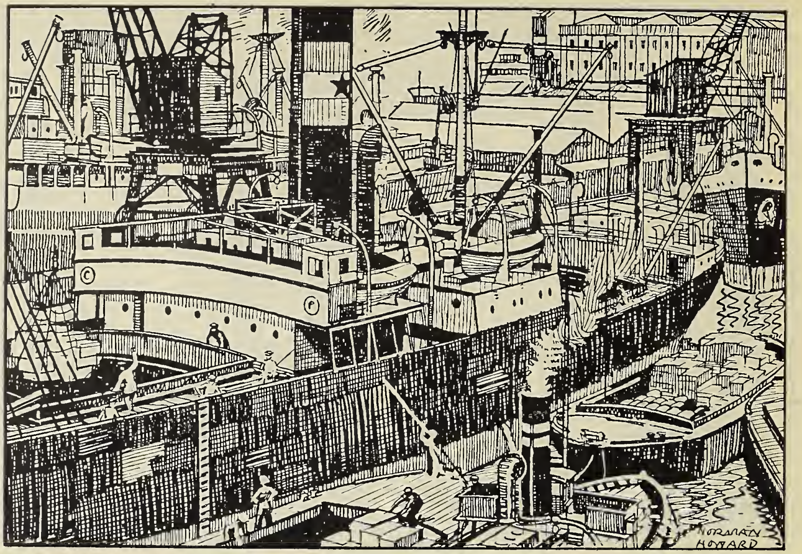
There is, too, the work of carrying all these things from place to place, and from one country to another.

There must be railways and motor lorries, and the work of loading and driving them employs many people in every country. Few countries have nothing to send to other countries, and few have no need of the food and goods that other countries can send them.

To many countries the journey is over the sea, and work has to be done in loading ships for their voyages. Sailors have to work at sailing the ships to their journeys' end.

And for all this travel and transport, railways, motors, and ships have to be built.

Illustration—Loading railway trucks.



The work of making and carrying things depends always on power. Power is the name we give to anything which will move a machine. Sometimes it comes from coal, sometimes from oil, sometimes from falling water, and sometimes, as we know, from the toil of men or animals.

But no matter whether the power comes from coal, or oil, or water, it does much the same work, and is used in many ways. It drives the machines we use, and it gives us heat and light.

Coal and oil can be burned to give us heat. The heat is often used for making steam to drive steam engines, and steam engines can drive ships, railway trains, and many other machines.

Oil is used for the engines of motor-cars, buses, lorries, boats and factories. Some of them use fuel oil, and some use oil in a form called petrol.

Coal and oil can both be used for driving the

Illustration—Cargo boat, tug, and lighters.

engines which make electricity, and so can water-power.

Electricity can be used for making heat and light, for driving railway trains and the machines in factories.

Power, in one form or another, is used by men in almost every country of the world. There are railway trains driven by steam or electricity. There are ships burning coal or oil, and there are electric power stations and gasworks to give people heat and light in their homes and workshops.

There are factories for making clothes, boots and shoes. There are works for making iron and steel, and all the many things, from tiny pins to mighty engines, that are made from iron and steel.

There are factories for making motor-cars and aeroplanes: and others for making cups and saucers and pottery. There is, in every part of the world, some

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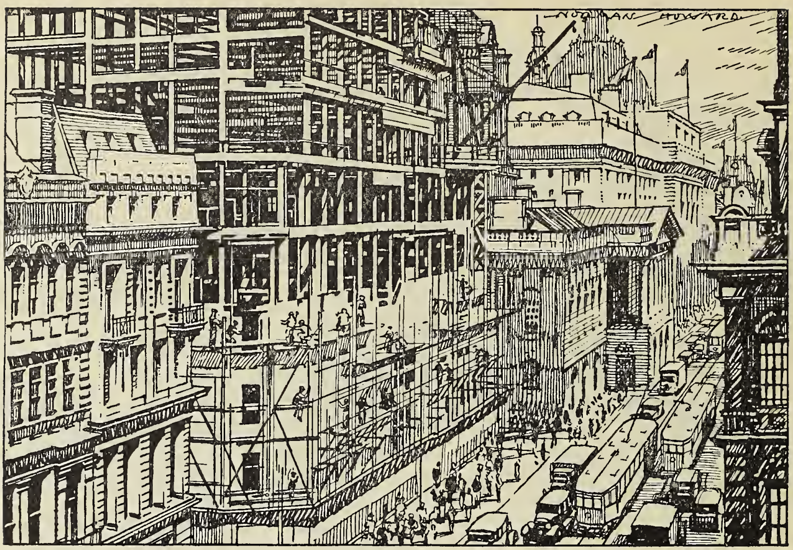
Illustration—International express and mountain railway (Montreux, Switzerland).



Illustration—Modern building and traffic (Italy).

work or industry being carried on.

And, of course, there are the places from which the coal and oil first come. There are coal mines, and oil wells, and electric power stations.

There is the work of carrying and moving the coal and oil from place to place.

And there is always the work of building factories, shops, and offices, and houses for the people who work in them.

All these kinds of work, and many other kinds as well, must be carried on all over the world, just as the cooking of food and the work of the house must go on in every home.

Wherever men live there is one kind of work which must always be done. It is the work of the kitchen, of cooking food and making it ready.

We do not expect to find the same food being cooked and the same work being done in every home, and in

the same way different kinds of work are done in different lands.

In one, it is coal-mining : in another, oil may be found : and in a third, the engines which burn coal and oil are made.

One country may be able to grow the cotton or tea, and another may be able to provide the wool or the rubber. But countries in other parts of the world may be better able to make the wool and cotton into cloth, or the rubber into tyres, and be able to buy much more of the oil or tea than the countries which provide them.

So it is that men in many different parts of the world must work together. The goods that are grown in one country are sent away to other places to be used in factories, and the goods that are made in factories are sent away again to shops, and then to the houses of the people who use them every day of their lives.

Illustration—The work of the kitchen.

The people who work in offices arrange that people in different places can work together in this way. There are many offices in every part of the world, and they have the task of making sure that the work that men do on farms, in factories, in carrying goods from one place to another, and in looking after warehouses, fits properly with the work of other people.

EXERCISES

PICTURES

Page 10. Describe the ship and the ways of loading her.

Page 12. Tell the story of the wheat-field and the harvest.

Page 13. Explain the work done in loading a train.

Page 14. Find all you can about the work done by tugs and barges.

Page 15. Compare these trains with ours, and with others in this book.

Page 16. On which side of the road are the cars running ?

Page 17. Name as many things as you can in this picture.

Page 19. Explain the work and use of a shop or store.

---

1. Which is the most important work of men all over the world ? Why ?
2. Name some things we send to other countries.
3. Make a list of things other countries send to us.
4. Say what you can about the different ways of carrying goods from place to place. Which of them are quick and which are slow ? Which are best for heavy goods, and which for light goods ?

GLOVES

FOOD

MEN and women must always have food, no matter in what part of the world they may live. So perhaps the most important work of all that is done in the world is growing things to eat, and preparing and cooking them.

Many kinds of food grow in various countries. In Arabia and other hot dry lands there are palm-trees on which dates grow. In India and China a great deal of rice and tea is grown, and on the islands of the Pacific there are many kinds of fruit. The people who live in each part of the world eat chiefly the things which grow there.

In nearly every country there are several kinds of food which grow fairly well. Wheat and potatoes, for instance, grow in a great many places ; and fish can be caught in every sea.

But there are certain special countries where one kind of food grows very well indeed. There are many sheep in Australia and New Zealand ; wheat grows well in Canada and Russia ; and so on.

Only a hundred years ago all food had to be grown near the place where it was to be eaten. It was not easy then to travel long distances, for there were no railways and no steamships.

Travelling was slow in those days, and nearly every kind of food goes bad if it is kept for a long time, unless special care is taken. In those days, too, it was very expensive to carry things long distances.

But in the last hundred years men have found out how to carry goods of all kinds quickly, by land, sea and

air, and cheaply, too. Still more important, they have found out how to keep such things as meat, butter, and fruit good while they are on a long journey.

To-day much of our food comes to us from the parts of the world where it grows best. Beef comes thousands of miles from the Argentine over the seas to our butchers' shops. Mutton comes all the way from Australia and New Zealand, on the other side of the world. Butter and bacon come from Denmark, Ireland, and New Zealand.

There are other kinds of food which come from far-off parts of the world. Sugar comes from the West Indies. Wheat for making bread, biscuits and cakes comes from Canada.

Tea comes from India, Ceylon and China. Coffee comes from Arabia and East Africa. Cocoa comes from West Africa.

Oranges and lemons do not grow in Britain. They are brought to us, across the sea, from Spain and the

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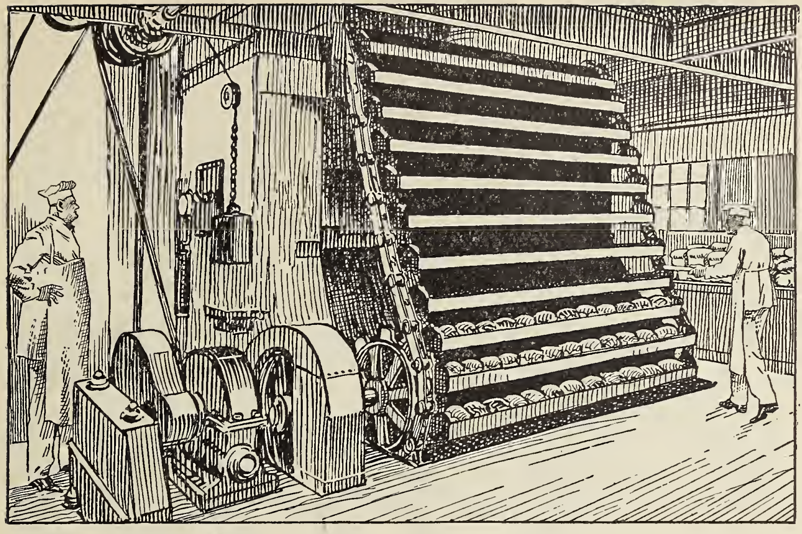
Illustration—Shipping frozen meat (The Argentine).



other countries round the Mediterranean Sea. Grapefruit comes from South Africa, and many of the apples we eat are grown in Australia, or California, in America.

Many kinds of food must be prepared in factories before they are sent to the shops. Bread, of course, comes from bakeries, where flour is made into loaves. So, too, do cakes and buns.

There are bakeries in almost every country of the world. The huge bakehouses where bread for great towns is made use many clever machines. The baking of the bread is done as the loaves are carried through the oven on an endless band of trays.

In smaller bakeries the work is done by hand, and the loaves are shaped and put into the oven one by one. And there are nearly as many kinds of bread as there are ways of doing the work of baking.

In France loaves are made long and thin, while in other parts of Europe bread is shaped into little rolls.

Illustration—Bread at the start of its journey through a modern oven.

In the north of Africa bread is made in flat cakes.

In Italy wheat is ground into flour and then made into a paste and shaped into long tubes, which, when dried, are called macaroni.

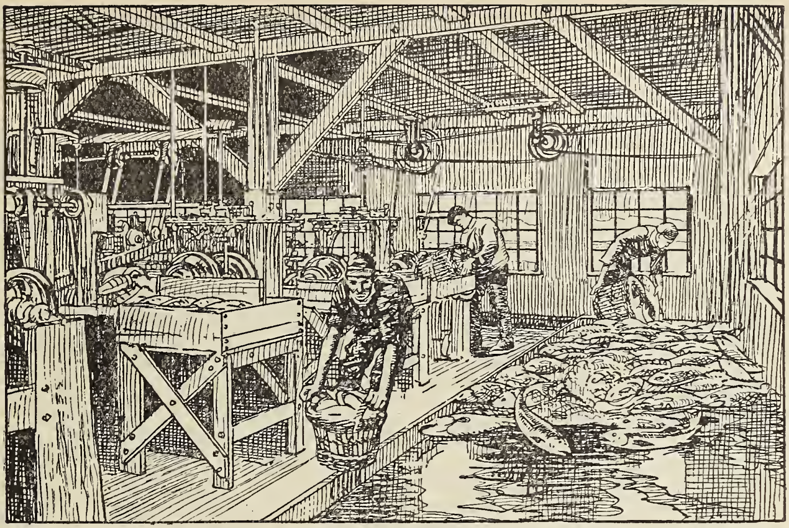
In Eastern lands, like India and China, hardly any wheat is eaten. The people there live on rice, which grows easily and well in the hot, damp soil.

There are bakeries in every country where wheat is used, and there are, of course, mills for grinding wheat into flour. In many countries, too, there are biscuit factories where all kinds of biscuits are made.

Many people work at growing wheat, grinding corn into flour, and making flour into bread and biscuits. Many more, too, work at carrying these things from place to place, by motor-lorry, train and ship.

Sugar, too, has to be manufactured before it is sold in the shops. There are great factories where it is cleaned and made into lumps, or ground into powder.

Illustration—A Continental confectioner (Austria).



There are factories where sweets are made. In some of them chocolate is made and packed, and in others toffee and other kinds of sweets. Every country of the world has places where sweets are made.

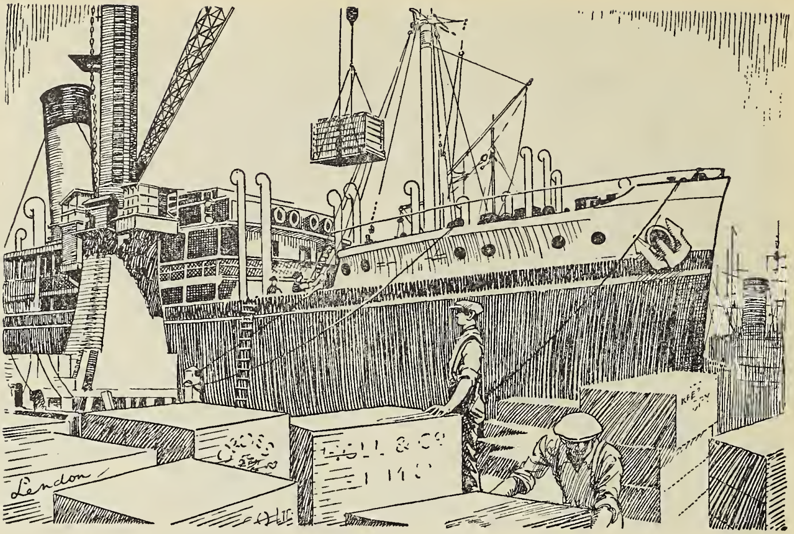
In many countries food is cooked and packed in tins, so that it can be kept good and ready to eat, no matter where it is sent. And food is tinned in the countries where it is cheapest and most easily found.

There are many salmon in the rivers of North America, and so tinned salmon often comes from that continent. In the tinning factories men use machines to clean the food and make it ready to be tinned, while other men cook it and pack it in the tins.

Sardines are found in the sea near Spain and Portugal, and tins of sardines are made in those countries, where the sardines are caught, and where there is plenty of olive oil to put in the tins with them.

Tinned fruit comes from the countries where fruit

Illustration—Preparing salmon for tinning.



grows well—California and South Africa—and a great deal of pine-apple comes from sunny Hawaii in the Pacific Ocean.

In some countries, such as England and America, meat is tinned, and soups and sauces made, to be sent away to every part of the world.

Every food factory must be a very clean place, for the meats and soups must be prepared, flavoured and cooked, before they can be packed in the tins or bottles.

After the tins have been packed they are heated, and sealed up so that no air can reach the food inside. Food which is sealed up in tins keeps good, because it has been heated and because it is closed up so carefully.

There are factories where fruit is made into jam. People work at growing and picking the fruit, and boiling it very carefully with sugar, before the jam is packed in jars and labelled ready to be sold in the shops.

For marmalade our factories use oranges from Spain

Illustration—Unloading food from a ship.

and Palestine, and sugar from the West Indies. The marmalade is sometimes sent from England or Scotland back again to the sunny lands where the oranges grew for the people who live there to eat.

From the great food factories tins, bottles, jars and packets are sent away to the shops. Sometimes they have to cross the seas, and nearly always they have long journeys to make, by railway and road, before they are opened and eaten.

The meat that was grown, cooked and tinned in England or America may be eaten in Africa or in China. Tea from India and China, and coffee from Arabia and East Africa, are drunk almost everywhere.

Jam from factories in England may be sent to the farthest parts of the world. Sugar comes from the sugar cane of the West Indies or from the beetroot farms of England and Germany to the great sugar-factories, where it is made ready for people to eat and use.

Illustration—A grocer's shop.

Fruit comes from the lands where there is fertile soil and bright sunshine. Beef and mutton, bacon and ham, cheese and butter, come from the lands where there are great grass lands, and many flocks and herds of cattle, sheep and pigs.

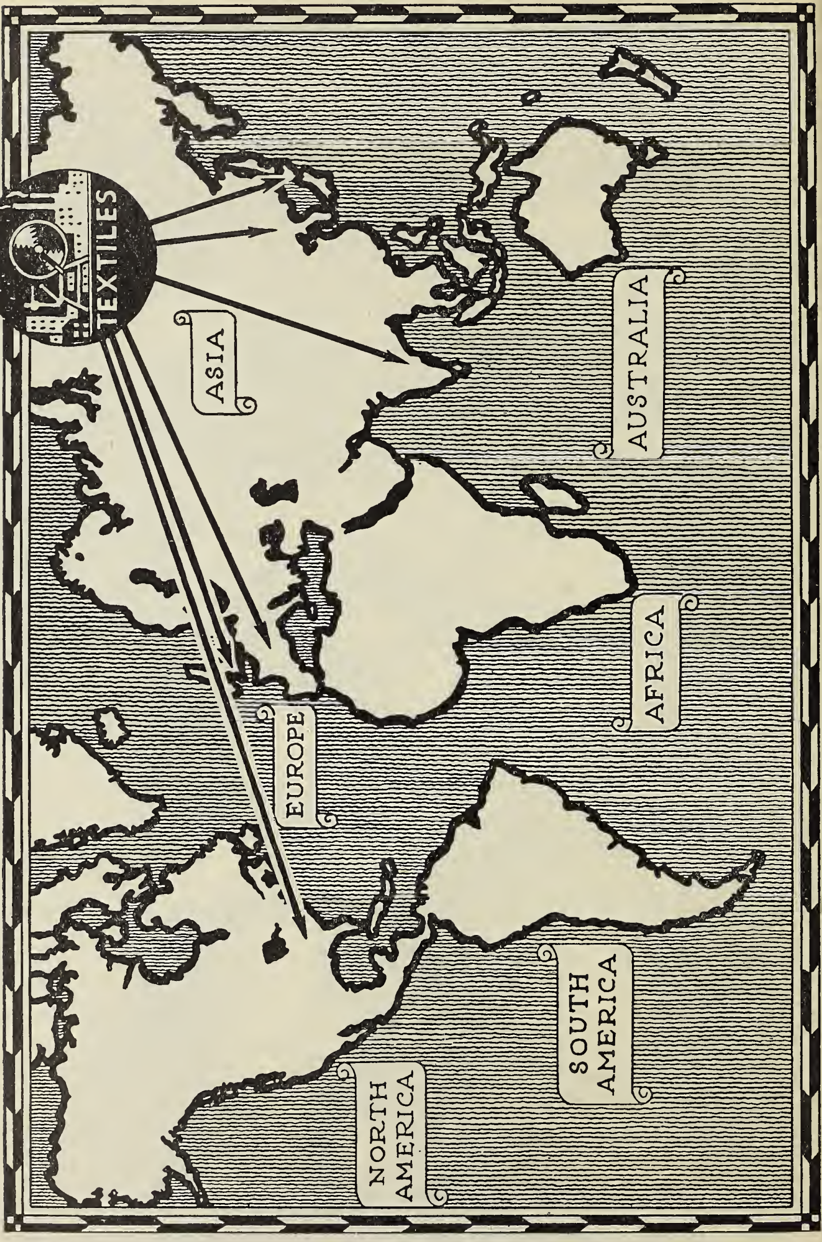
All over the world men and women work on farms and in factories to produce the food that we buy in our shops. Many others work, too, at packing and selling the food, while thousands and thousands are busy loading ships, trains and lorries, so that food may be carried over the world to the countries and the people who need it.

EXERCISES

PICTURES

Page 20.	Why do men plough the land? How is it done in different countries?
Page 22.	How will the meat be kept good on the voyage?
Page 23.	Explain how the bread is baked in this oven.
Page 24.	Compare the oven and the loaves with those on page 23.
Page 25.	Tell the story of a tin of salmon.
Page 26.	How is this ship being unloaded?
Page 27.	Tell the story of the biscuits or the barrel of apples.
Page 29.	What are these people doing? Choose a meal for yourself and tell its story.

1. Tell the story of a slice of bread and jam.
2. Make a list of some things you eat which do not grow in your own land. Where does each grow well?
3. How does your food differ from the food eaten by the people in China? Explain why.
4. Make models of different shapes of loaves you have seen.


TEXTILES
NORTH AMERICA
SOUTH AMERICA
EUROPE
AFRICA
ASIA
AUSTRALIA

TEXTILES

THE clothes that people wear in other parts of the world sometimes seem rather strange to us. The Arabs who live in the North of Africa have long flowing robes, and wear a cloth over their heads instead of a hat.

The negroes who live in the hot places of Central Africa wear only small strips of cloth. But the people who live in the cold lands of the frozen north must wear a warm and heavy kind of dress.

People who have to work in bad weather wear warm and waterproof clothes. Sailors have warm jackets to protect them from the wind, and oilskins to keep them dry in rain and spray.

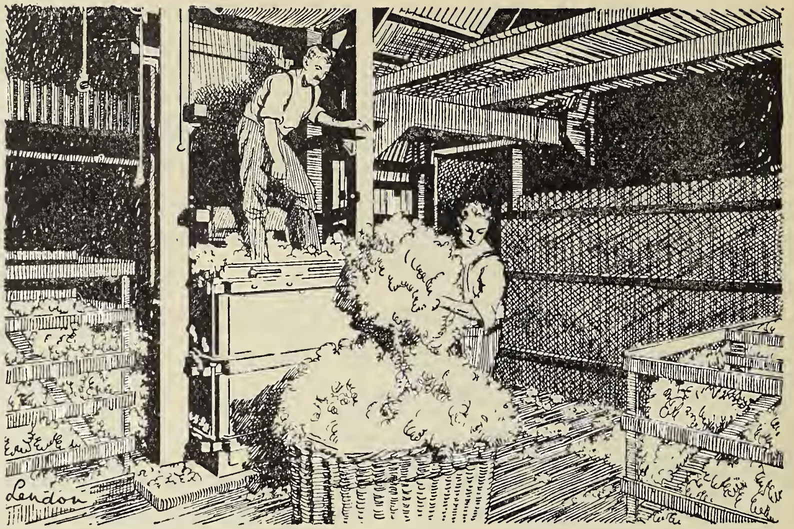
People who have dirty and difficult work wear overalls or ' boiler suits ' to keep themselves clean.

The clothes that men and women wear depend greatly on the countries where they live and on the work they have to do. In very many parts of the world they wear just the same ' European clothes ' that we see and wear every day.

Even so there is some difference, for in hot countries the clothes are made from light cloth of white or light colours. In cold countries, of course, people's clothes are made of much heavier, thicker cloth.

But no matter what clothes people wear, they are all made from cloth of one kind or another. And so many, many men and women must work at weaving the cloth and at making it into clothes.

Cloth is made from many things—from cotton, wool, silk, flax, and artificial silk.



Cotton comes chiefly from America, Egypt and India, where the climate and the soil are very good for growing cotton plants.

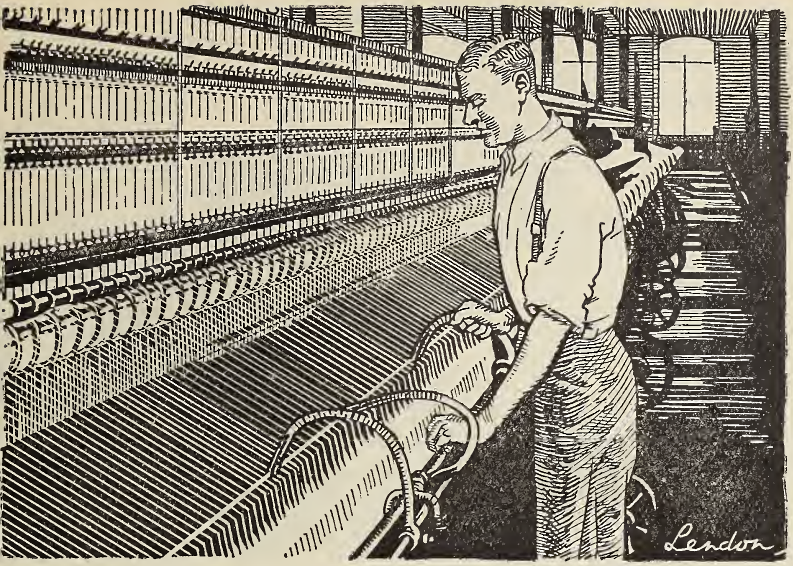
Wool is the fleece that is shorn from sheep, and most of it comes, of course, from the great sheep-farming countries—Australia, New Zealand, the Argentine, and Britain.

Silk comes from the East, and China is famous for its silkworms. But artificial silk is made from many things, such as wood and straw, which are cleverly treated to give shiny threads.

Cotton from the cotton plants comes in masses of cotton-wool. Wool comes in tangled tufts from the fleeces of the sheep. And silk comes in the tightly wound cocoons of the silkworm.

In every case the first thing is to clean the raw material and spin it into thread. The cleaning is done by machines which beat and wash the cotton or wool.

Illustration—Packing and pressing wool (Australia).



Silk is soaked to loosen the cocoon, and the thread is then unwound.

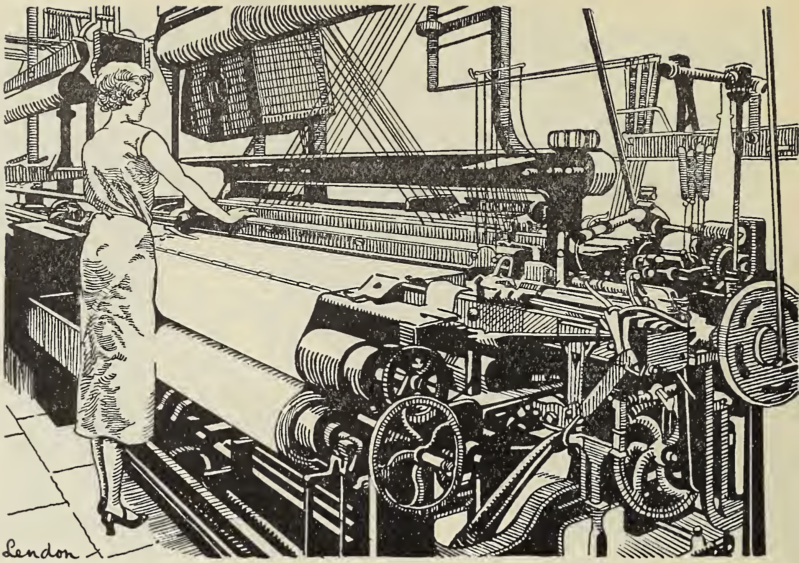
Then, after the cleaning, the wool or cotton or silk is spun. Clever machines take the tangled mass and twist it into a long thread which is wound on bobbins.

Once the thread has been spun it is ready for weaving into cloth. The weaving is done on a great machine called a loom, in which threads running from side to side cross the threads which run from end to end to make the cloth.

If all the threads are of cotton, then cotton cloth is made. If the threads are of wool, then it is woollen cloth, or perhaps flannel, that is made. If some of the threads are cotton and some are wool, then it may be flannelette that is made.

Silk cloth, of course, is made by weaving silk threads. And threads of artificial silk are woven into a smooth and shining cloth often called rayon.

Illustration—Spinning cotton.



Cloth can be made beautiful by weaving designs in it, and arranging the threads so that they make patterns or pictures as the cloth is woven.

Very often the threads are dyed before they are woven, and threads of different colours used to make a pattern.

And the cloth, once it has been made, can be dyed, too. Many men and women work in dyeworks, making threads and cloths of beautiful colours.

When the cloth has been made it is ready to be cut out and sewn into clothes, and a great many people, in every part of the world, work at making clothes. There have been tailors and dressmakers all through the history of the world.

In Britain, cotton thread is spun in Lancashire, because the air there is damp, and cotton can most easily be spun where it is moist. If the air is too dry the cotton breaks very easily.

And in Lancashire, too, a great deal of cotton cloth

Illustration—Weaving on a loom.

is woven. Cotton goods are also made in India, in America, and in Japan.

From all these countries the cloth is sent to many other lands, and chiefly to hot places, for cotton is cool and light, to be used for clothes and robes.

Woollen thread and woollen cloth are chiefly woven in Yorkshire, where, hundreds of years ago, great flocks of sheep were kept. And to-day Yorkshire is still famous for wool and woollen cloth.

English cloth is sent all over the world. But every country where many people live has its own factories for weaving cloth.

Silk is woven in many places. In China, of course, it is made into cloth. France is famous for the silk cloth that is woven at Lyons. And in some parts of England, too, silk cloth is made.

England, Germany, and America are busy with the work that comes from the making of stockings,

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Illustration—Winding artificial silk.

clothes, and thread from artificial silk.

Linen is the oldest of all cloths. It was made thousands of years ago, before ever wool and cotton were used.

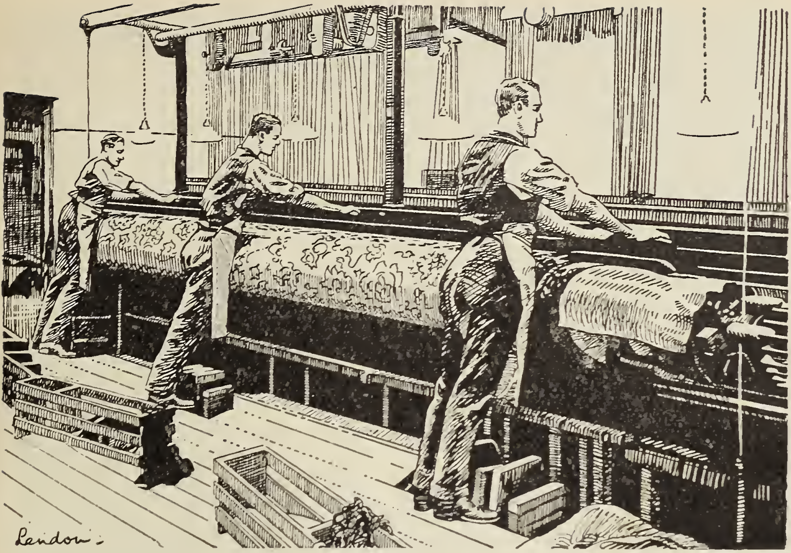
Linen thread comes from the fibres of a plant called flax. The flax, when ripe, is pulled up, dried, and then steeped, or soaked in water until nothing is left but the stringy fibres of the stems, which are very fine and smooth.

These fibres are spun into thread in just the same way as cotton or wool, and the thread is used for making linen cloth.

Linen is soft and smooth and strong. But it can be made only from the rushes of the flax plant, which grows about three feet high and has bright blue flowers. Flax needs a damp soil, and grows well in Ireland and Russia and some parts of America.

Ireland is famous for making linen, and linen thread is woven into such things as table cloths, handkerchiefs, and sheets, as well as cloth.

Illustration—Steeping flax (Ireland).



Cloth, whether it is made from cotton, wool, flax, silk, or artificial silk, is very important. It is used, all over the world, for making clothes and many other things.

Threads can be made fine or coarse, and woven or knitted into a great number of different kinds of cloth.

Many people find work in weaving thread into carpets, rugs, curtains, and all the many other textiles we use.

Some people are busy carrying these goods from place to place, and others in buying and selling them, or in making and sewing them into the clothes and shapes which people need.

Cloth of all kinds, carpets, and rugs have to be sent from the places where they are made to the places where they are used and worn. And so the making of cloth means a great deal of work for people who drive trains and lorries.

Illustration—Carpet weaving.

The making of cloth we call 'textile industry,' for the word 'textile' means a thing that has been woven. And textiles—or all these many kinds of woven goods—are very important in the work of the world.

EXERCISES

PICTURES

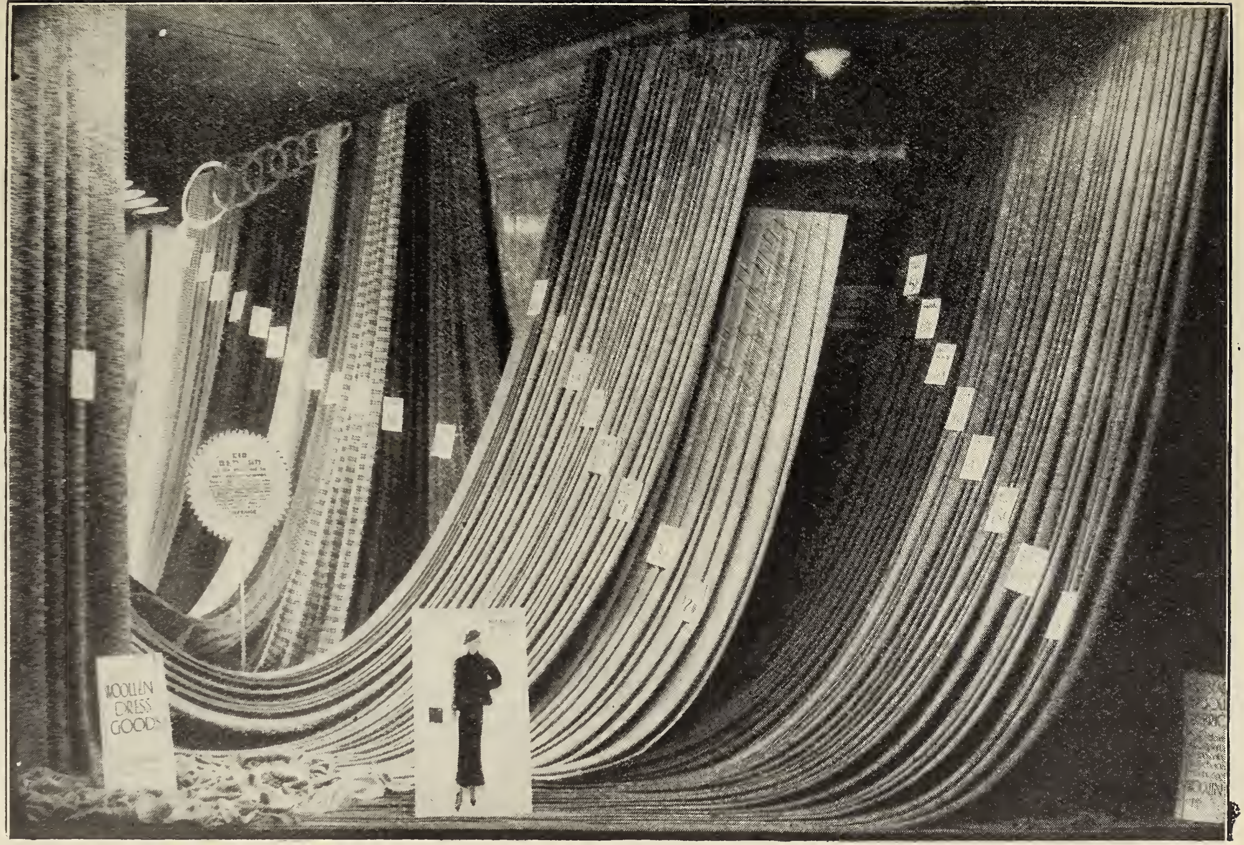
Page 32.	What will happen to this wool after it has been packed in bales?
Page 33.	Why are they twisted into threads?
Page 34.	What is made by weaving the threads?
Page 35.	Say what you can about real silk and artificial silk.
Page 36.	What are the men doing to the flax? Why?
Page 37.	Examine a piece of carpet and explain, as well as you can, how it is made.
Page 39.	Make a list of the things into which this cloth may be made.

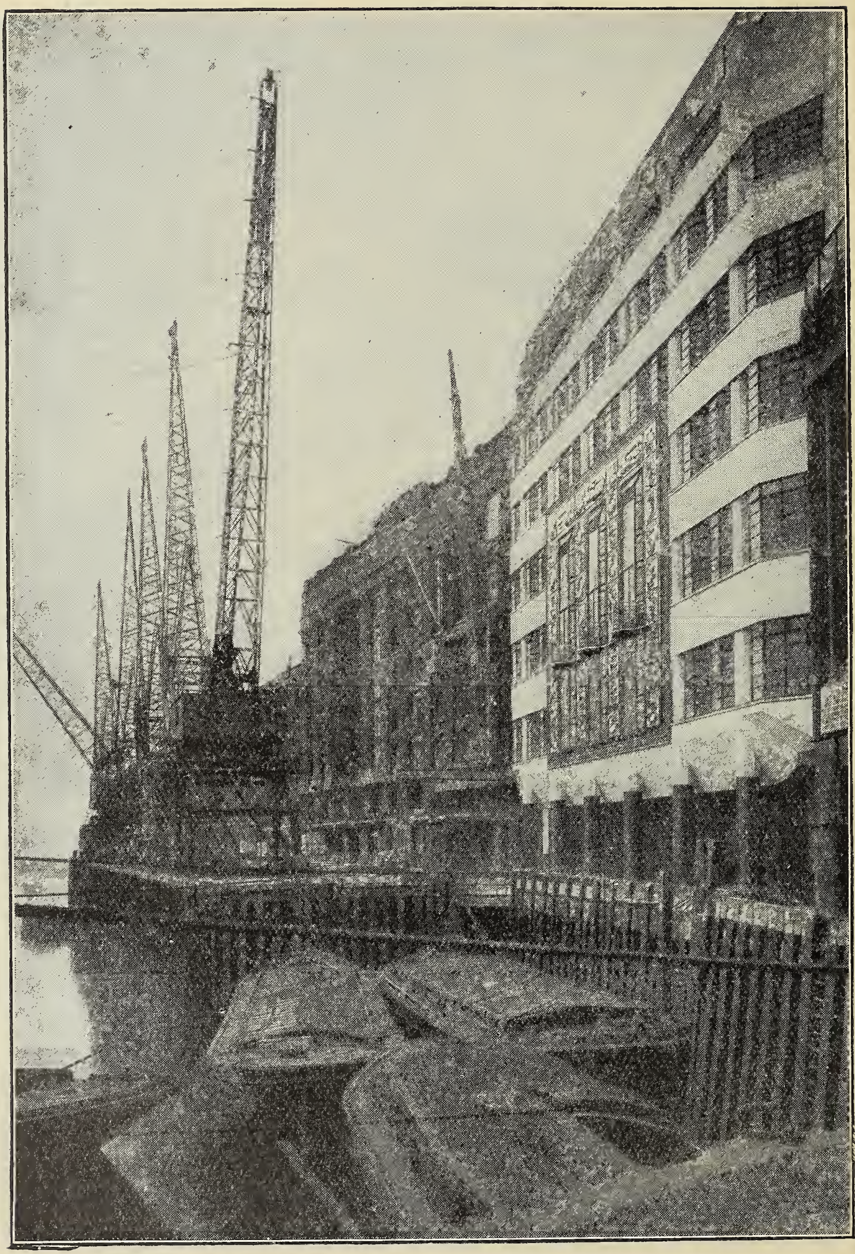
MAP

Page 30.

1. Find from the map at the end of the book the names of the countries pointed out by the arrows.
2. Write their names and say which of them grow cotton, and which grow silk.
3. Where do we get the cotton and wool from to make our cloths?

1. What do we mean by textiles? Make a list of things you use which are woven from threads.
2. Where would you expect to find people wearing (*a*) cotton clothes, (*b*) woollen clothes?
3. Collect threads of cotton, wool, silk and linen. Try to find what differences there are between them.


WOOLLEN DRESS GOODS



BUILDING

THERE are many different kinds of buildings in the world. In hot countries houses are built to be cool and airy, and to give shelter from the sun. But in cold places they must be built so that they keep people warm, and protect them from wind, rain and snow.

Almost every house, wherever it is, is built with materials which are found near by. Stones and bricks and timber are heavy, and it is a very expensive matter to carry them long distances.

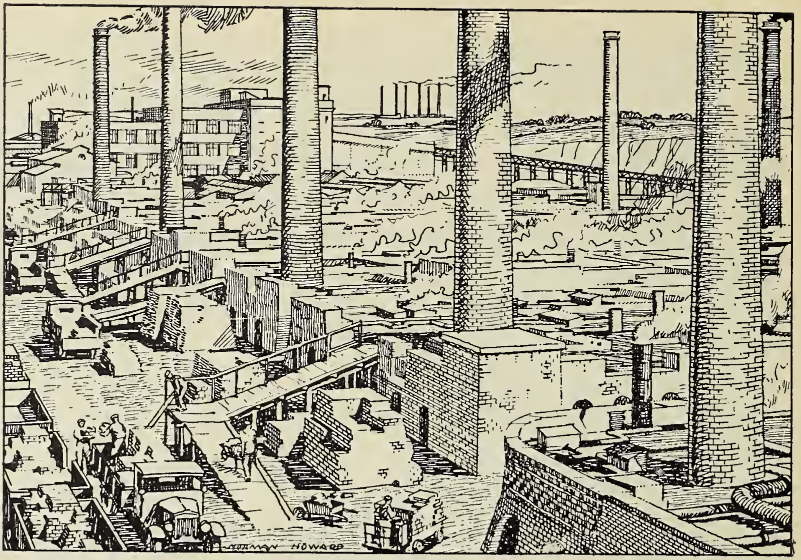
In countries where there is plenty of stone most of the buildings are made of stone. Where there is clay for brickmaking, bricks are used. Where there are many trees, as in Norway, Sweden, Switzerland, and Canada, there are timber houses.

Sometimes other things have to be thought of. Earthquakes often happen in Japan, and many Japanese houses are built of wood and paper, so that little damage is done if they fall down.

The roofs of houses, like the walls, are made with things found near at hand. Straw is sometimes used for the pretty thatched roofs of country cottages, because there is plenty of straw wherever corn is grown.

Tiles can be made from clay, just as bricks are made, and so brick houses often have tiled roofs. Where slate is found, slates are nearly always used.

Men have built houses for many thousands of years. Long, long ago, in Egypt and Mesopotamia, they used to build with bricks. There is mud and clay beside the



rivers of Egypt and Mesopotamia, and the hot sun there quickly dries the clay into bricks.

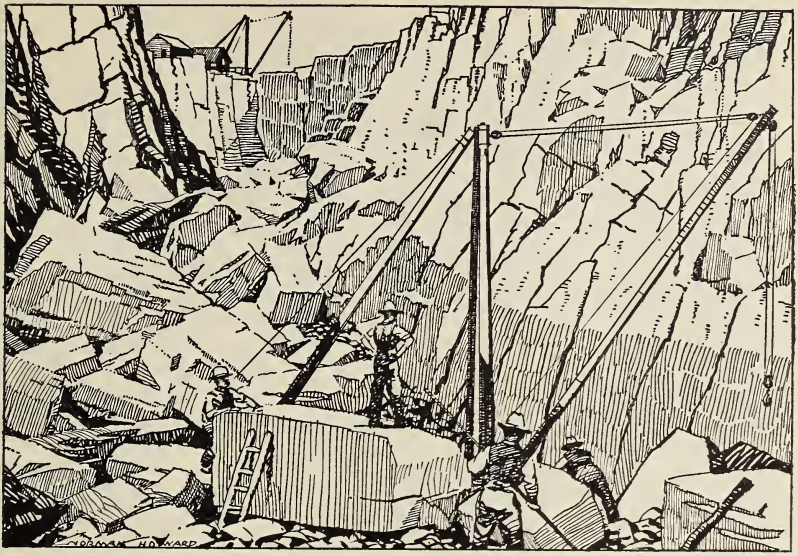
Long ago, too, men learned how to use stone for building. In Greece, and the Italy of ancient Rome, many fine and beautiful buildings were made from stone, shaped by clever, patient workmen.

In other countries buildings were made by shaping mud into high walls, and then leaving the mud to dry in the sun and air. Many of the cities and houses of Morocco and North Africa were built from mud.

Building to-day is done in very much the same way. Builders still use bricks, though the bricks are better shaped and better made than they were in the early days in Mesopotamia.

Men have to work at making bricks for walls, and tiles for roofs. Bricks and tiles are made from clay, and the clay has to be dug from the earth and carried to the brickworks, so that it can be cleaned and made smooth.

Illustration—A large brickworks.



At the brickworks the bricks and tiles are shaped. They are baked and then sent away by train, by barge, or by road to the places where houses and factories are to be built.

Sometimes the bricks or tiles are made smooth and coloured, so that buildings shall be beautiful. And some of them are glazed like china and pottery so that they can be kept clean.

Many people work at making bricks and tiles, and many more find work in moving them, by railway, road, or ship (for bricks are very heavy) to the places where they are used.

Bricks and tiles are made near the places where clay is found. And stone, too, must be prepared at the places where it is found.

Stone is dug and cut out of the ground in great quarries. Skilled workmen break away the stone and then cut it to the right shape. Then the stone, like the

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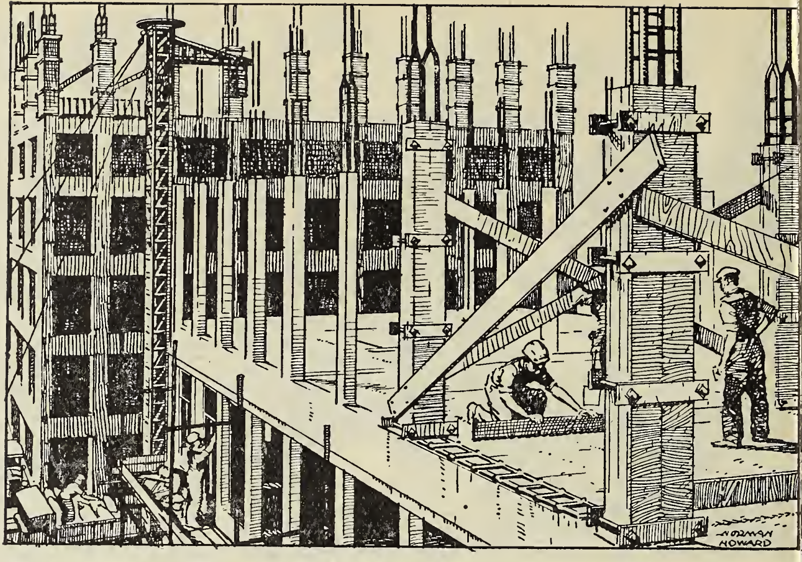
Illustration—A stone quarry.



Illustration—Building in steel and concrete.

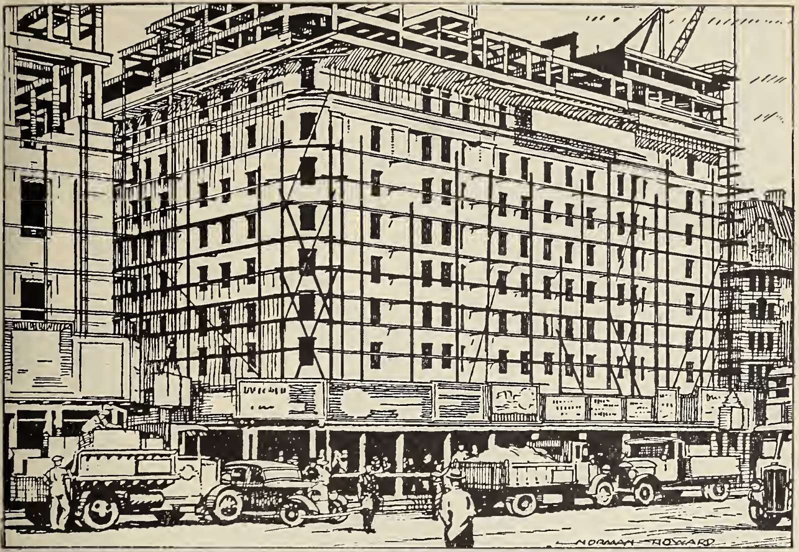
bricks, has to be carried to the places where the buildings are being put up.

There are many different kinds of stone, and they are found in many parts of the world. Italy is famous for the marble that is dug out of its quarries, and marble is very beautiful.

Granite can be polished, and it is not only beautiful, but also very hard and strong. The pyramids and statues in ancient Egypt were built of it. Most of our granite comes from Scotland, the blue-grey kind from Aberdeen and the red from Peterhead as well as from Norway.

There are many other kinds of stone used for building, and Portland stone, named after Portland in Dorset, has been greatly used in the buildings in London.

In every part of the world the stone which is found closest at hand is used for building. In many parts of the south of England flints, set in mortar, are used,



because flints are found in the chalk hills of that part of the country.

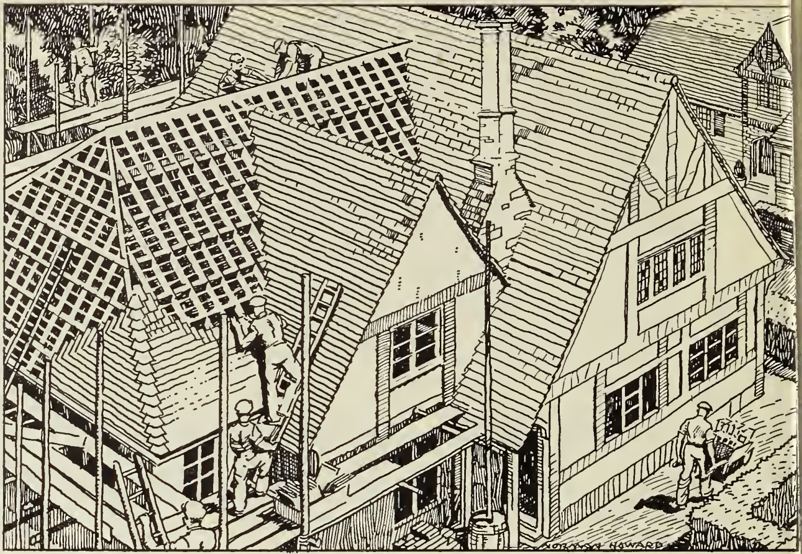
To-day a great number of our finest buildings, as well as many of our bridges, are made of concrete. Men build with it in very much the same way that they used to build with mud many, many years ago.

Concrete is made by mixing cement with sand, gravel or small pieces of stone, and then adding water. Because these materials can be found almost everywhere concrete can be made and used in every part of the world to which cement can be carried.

It can easily be shaped while it is wet, though it is as hard as stone when it is dry. Many buildings made of concrete are shaped around a framework of steel to give them even greater strength. In this way the very tall buildings called " sky-scrapers " are built.

Concrete hardens under water, and is therefore often used for bridges, breakwaters, and dock walls.

Illustration—A large building.



Building must be done in all the countries of the world, for, wherever people live, they must have houses in which to dwell and work. Houses and buildings of every kind —factories, offices and warehouses—are needed all over the world, and many men find their work in building.

Bricklayers put the bricks in their right places and set them firmly in mortar to make the walls. Stone masons shape great blocks of stone and fit them into place. Workmen build great frameworks of steel and cover them with walls of concrete.

But the walls of a building are not all. There must be a roof, and there must be floors. Workmen divide the building into storeys and rooms.

Still more workmen find their work inside the building. There are plasterers to cover the walls which divide the rooms from each other, and to make the ceilings of the rooms.

Carpenters make doors, windows and cupboards.

Illustration—Roofing a house.

They lay the floors and put in the stairs. In big buildings, of course, there are workmen who put in lifts.

Plumbers fit pipes and taps and tanks, so that the building shall have hot and cold water. Electricians put in the wires for light and heat and power, and gas-fitters have gas pipes to fix.

Workmen have to lay drains, and more workmen have to join the house to the electric mains, the gas mains, and the water mains.

When all the other work is done, the painters paint the building inside and out, and paperhangers put up the wallpaper.

All the many things that are needed by these workmen must be made. Timber has to be brought for the carpenters. Pipes and tanks and taps have to be made for the plumbers. The electricians must have wires and switches.

Illustration—Plasterers at work

There are factories for making all these things, and there are factories, too, for making paint and wallpaper. Many more people than those who work in the house that is being built owe their work to building.

When the house is finished there is still the furnishing to be done. In Japan only a few mats and some small tables are needed. But in other parts of the world many different articles of furniture are used.

Tables, chairs, beds and cupboards are made from wood by clever cabinet-makers and joiners, and then polished by skilled polishers to make them beautiful.

Buildings that are used as offices have their own special kinds of furniture. And shops, of course, have great windows made of plate glass.

Wherever men live—wherever there is a town or a village—there is building to be done.

Buildings have to be put up all over the world—in the great cities, and in quiet parts of the country. And all of them have to be built of the right materials and of the most suitable size and design for their purpose.

Cathedrals, churches, schools, factories, offices, shops, and houses may be built of quite different materials, but all of them need many men and much work in their building.

And this is true, though the buildings which are put up are very different in every country of the world. America is famous for the high 'sky-scrapers' in its great cities, built of steel, concrete and stone.

Houses in China are built round open courts for air and coolness. But in Switzerland, high up among the mountains, they are made small and warm, because it is cold in the winter. And in Italy they are open to the air, and very shady, because the sun shines brightly.

There are as many different ways of building houses as there are countries in the world, but everywhere the building of houses and factories and offices gives work and wealth to many, many people.

EXERCISES

PICTURES

Page 40. Part of this building is old and built of brick, and part is new and built of concrete. What differences do you notice between them?

Page 42. Why are there chimneys in this brick works?

Page 43. What work is done in a quarry? What kinds of quarries do you know?

Page 44. Explain this kind of building.

Page 45. What change has been made from the picture on page 44?

Page 46. How is a roof like this built? Describe other kinds of roofs.

Page 47. What are these men doing? Why?

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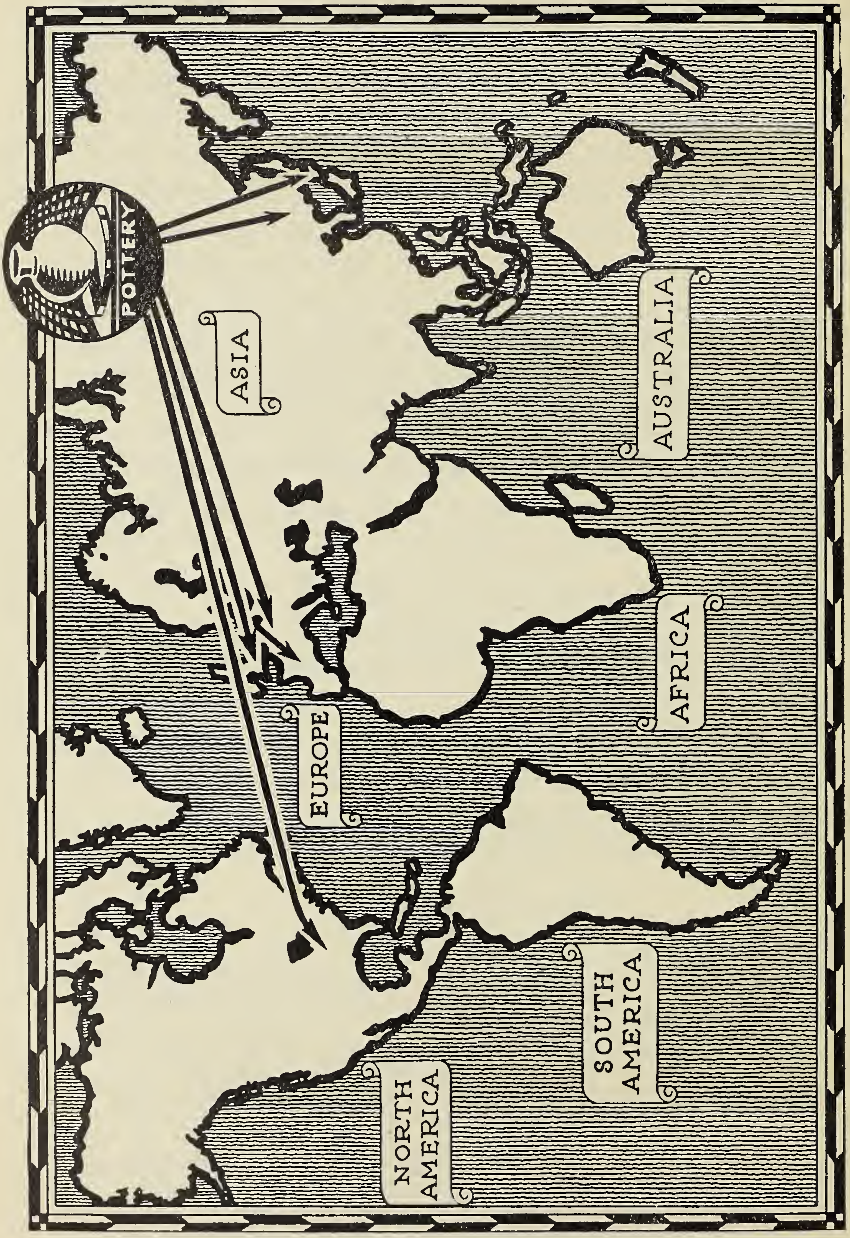
1. Which rocks and stones have been used in making the buildings near your school?
2. What is the work of a carpenter, a plumber, and a plasterer?
3. Collect a brick, a tile, and a slate and notice their shapes and sizes, and how they are made.
4. Make a model of a plasterer's trowel.


POTTERY
ASIA
AUSTRALIA
EUROPE
AFRICA
NORTH AMERICA
SOUTH AMERICA

POTTERY AND GLASS

IT was a long time ago that men found out how to make pots and bowls of baked clay. At first the pots were very rough, for they were made from soft clay scooped up by the riverside, and left to harden in the sun.

As time went on, men found out how to make the clay cleaner and smoother by washing it. They found out, too, how to shape the clay better by using a potter's wheel, and how to make it very hard by baking it in a fire.

It was in Mesopotamia, Egypt and Greece that the first pottery was made. We usually call pottery of this kind earthenware, for, though it is beautifully shaped, it is often thick and rough like a tile.

The Romans, who lived in Italy long ago, also made pottery, and, like the Greeks and the Egyptians, they painted pictures and designs on their bowls and vases.

We can see the pottery of these ancient peoples in our museums. But in almost every other country of the world men made pottery, though it was much rougher than the pottery of Egypt, Greece, and Rome.

Pottery has always been an important part of men's work because pots and bowls made from baked clay will hold water and food, because they can be heated in a fire, and because they can easily be cleaned.

But for many thousands of years pottery, or earthenware, was far too heavy and clumsy and easily broken to be used for cups and plates. Cups were therefore made from horn or from metal ; and plates from metal or wood.

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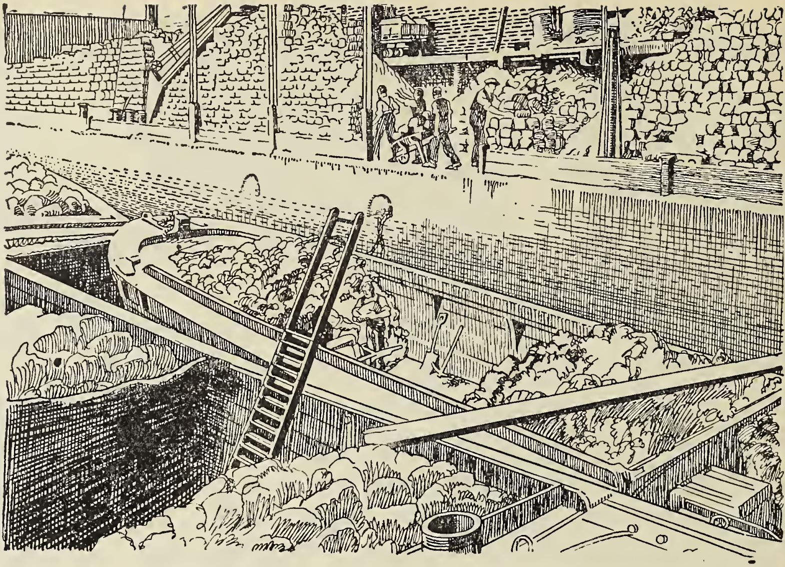

Then, in far-off China, about many hundreds of years ago, fine pottery began to be made. Sometimes it is called porcelain, but the name we use most often is china. It is light, and smooth, and often so thin that the light can be seen through it.

For hundreds of years china was very rare and precious. No one outside China knew how to make this thin, delicate, shining ware, or the secret of the beautiful colours with which it was decorated.

But, two or three hundred years ago, people in other lands began to find out how to make it. And to-day there are factories for making china cups and saucers, plates, bowls, and vases, all over the world.

There are the Potteries of Staffordshire, and many other factories in England. There are famous china factories in France, Germany and Italy. And people make pottery in many other parts of the world.

All china and all earthenware is made, of course, from

Illustration—Unloading clay from barges into the claypits.

clay. And everything depends on the clay that is used. If it is clean, fine, white, and smooth (and this was the secret of the Chinese) the porcelain is fine, thin and strong. The best and finest clay comes from Cornwall, Devon and Dorset, and it is used to make china in many parts of the world.

Clay and the other things needed to make china are heavy, and so potteries are often near canals or rivers, because it is cheaper to carry heavy things by water.

The clay is unloaded from the barges and taken away to great pits, where it is kept until it is needed.

Then it is dug out and carried away to be mixed with water to make a kind of soft paste, and then washed with more water until it is quite clean and smooth.

Next, the clay is mixed with other things—such as ground-up stones and powdered bones—until it is the right mixture for making the cups and plates and jugs we know so well.

Illustration—Digging clay from a claypit.

The clay is rather like a sloppy paste when it is ready to be used. For some things this paste, or 'slip', as it is called, is poured into a mould.

The mould gives it its shape, and helps it to dry. When it is firm enough to be taken out of the mould the finishing touches are put to it, and it is sent to the ovens to be 'fired' and made hard.

Often the jug, or vase, or dish which is to be made is shaped on the potter's wheel. This is a small flat table which is made to spin round and round.

The potter puts a lump of clay on the wheel, and the clay rises up as the wheel spins. The potter shapes it, using his hands and some simple tools, until he has made the object he wishes. Then he takes it off the wheel and sends it away to be baked.

The clay dishes, cups, jugs, and bowls are packed in special trays ready for baking. The trays are stacked up and taken into the huge ovens. When the oven is

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Illustration—Packing clay dishes and filling the oven before firing.

full the opening is bricked up to close it, and the fire lighted.

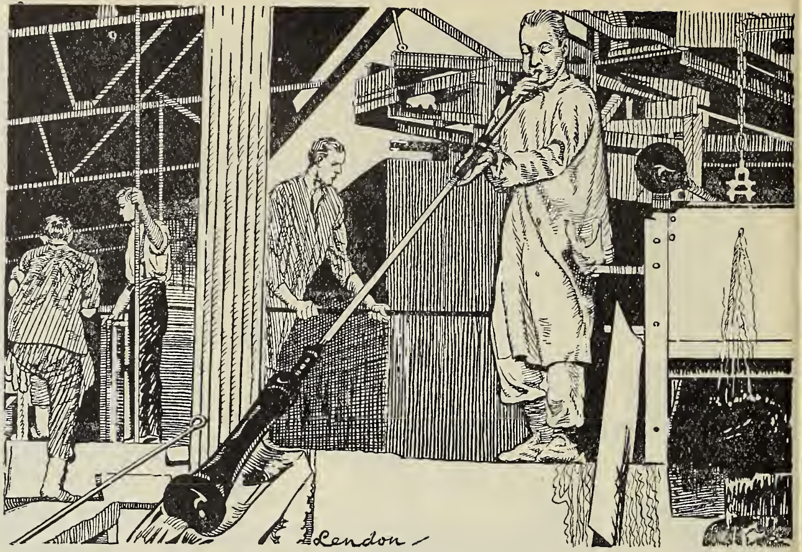
While they are in the oven the pieces of pottery become hard. But they also become smaller, for the clay shrinks as it dries ; and the finished cups are a good deal smaller than the cups that were made of the wet clay.

When the china has passed through the ovens, it is hard, and dull, and rough. It is no smoother than the pottery and earthenware of the ancient people, and, of course, it is quite plain.

Designs and pictures have to be painted on it, and people draw them with paints and brushes. The colours they use are quite different from the colours which will appear on the finished china, because the colours change while the china is baked again.

The artist may use a brown colour, where the finished colour after baking will be red. And the lines and

Illustration—Painting the china.



designs which will be bright gold on the finished china appear black before the baking is done.

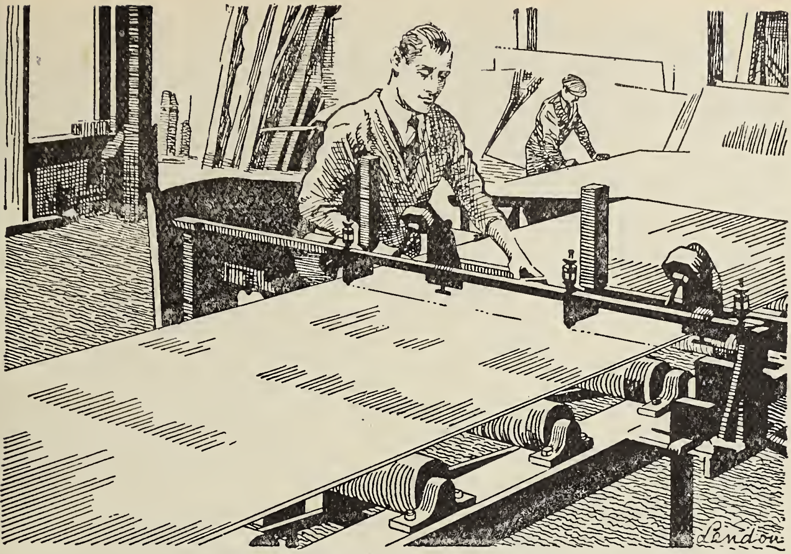
After the painting is finished the china is dipped in a bath and sent away to be baked again. The bath holds the 'glaze', which covers the rough china with a smooth glassy covering, and the baking makes the 'glaze' hard and firm. The second baking, too, changes the colours of the design that has been painted on the china.

At last the china is finished, and the cups and plates and dishes and vases of every kind with their beautiful colourings are ready to be sent away.

Trains and barges and ships carry them from the potteries to the shops. And because of all the work that is done in these factories there is pottery in almost every house all over the world.

With china we often think of glass, but glass is quite different. Glass is made, not by baking a paste to make it hard, but by cooling a red hot liquid to make it solid.

Illustration—Blowing glass.



Sand and many other things are melted together to make liquid glass. The sand must be very clean and pure, and the mixture must be made very carefully, for the glass may have to be clear and bright, or made of some special colour.

Then the glass is cooled. Sometimes it is poured into moulds, and cools into beautiful shapes. Sometimes, while it is still hot and soft, it is rolled out between rollers into great sheets which are cut up and used for window panes. And sometimes it is shaped by a glass blower, who uses the very simple tools—a blowing tube, tongs, and scissors—which men have used for hundreds of years.

Sheets of glass are sometimes polished and made smooth, to turn them into plate-glass for mirrors and shop windows. Sometimes they are made rippled, or ground to make them cloudy, so that people cannot see through them.

Illustration—Cutting plate glass into sheets.

Glass from the moulds is often cut and polished to make it shine and sparkle, and clever workmen can make beautiful ornaments from glass.

To-day glass is made all over the world. England is famous for glass, and so are Germany and Czecho-Slovakia (from whence comes Bohemian glass). And Venice in Italy has for many years been famous for its fine, delicate, coloured glass.

EXERCISES

PICTURES

Page 52. Why is the clay brought by water and not by rail or road?
Page 53. What will these men do with the clay?
Page 54. Explain what happens in the ovens.
Page 55. What is curious about this painter's work?
Page 56. How does the glass-blower work?
Page 57. What is this glass likely to be used for? What is the man doing?
Page 59. What is this man making? How does he work?

MAP

Page 50.
1. Name the chief countries which make pottery.
2. Explain why some kind of pottery is made in almost every land.
3. Why do we speak of our cups, saucers, plates and bowls as "china"?

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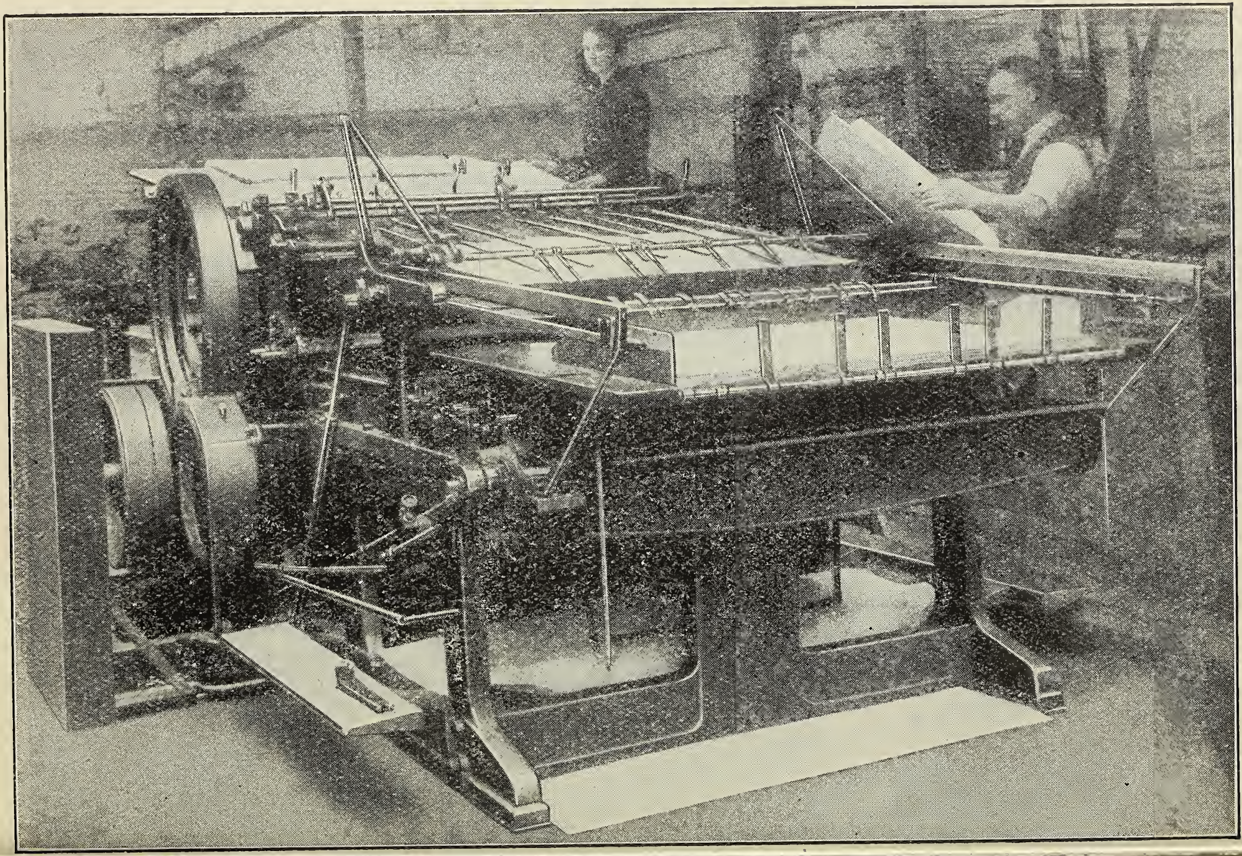
1. What do we mean by pottery?
2. Give the story of an earthenware pot.
3. How is glass made, and how is it made into the shapes we see?
4. Describe a piece of plate glass, a piece of cut glass, a piece of ground glass. Collect a piece of each.
5. Collect a few pieces of earthenware and also of china, and find the difference between them.



PAPER AND PRINTING

A SHEET of paper is nothing like a bundle of rags, or a handful of grass, or a log of wood. But, none the less, paper is made from rags, grass and wood, and there is some of each in every page of this book.

Paper is very useful indeed. It is used, of course, for books, newspapers, and for writing letters, but it has many other uses.

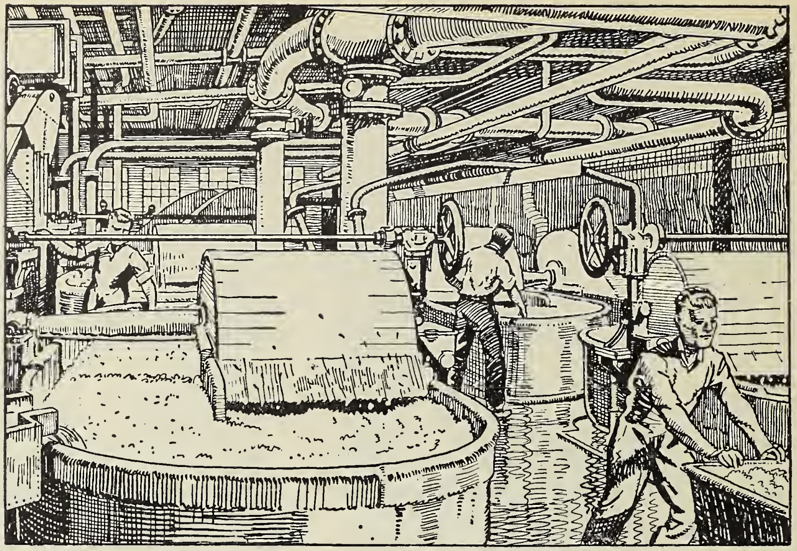
The envelopes for our letters are made of paper. Parcels and packages of all kinds are wrapped in it. Cardboard is a very thick kind of paper. The cups we use for cream and for ice cream are made of paper.

In the beginning the rags, grass, and wood have to be prepared very carefully. In each there are many little threads, or fibres, which can be put together to make a thin white sheet. The work of paper making is to prepare and use these fibres to make a strong, firm sheet of paper.

The rags and grass and wood are boiled with water and soda to make them soft and pulpy. But they are not all boiled together in the same boiler. There are huge boilers where the grass is softened into pulp. The wood is cut into little pieces, and boiled into wood-pulp in other boilers. The rags have their own boilers, too. And each kind of pulp has to be washed to clean it.

But even after it has been washed the pulp is a long way from being white. The grass was green at the beginning. Rags are of all colours. And different kinds of wood have their own colours.

The pulps are taken away to big tanks to be bleached.



Chemicals are added to them to make them white, and then, of course, they are washed again. By this time the grass, wood and rags have become very soft. The pulp is now like soup. But the little fibres have not yet been broken up enough to be made into paper.

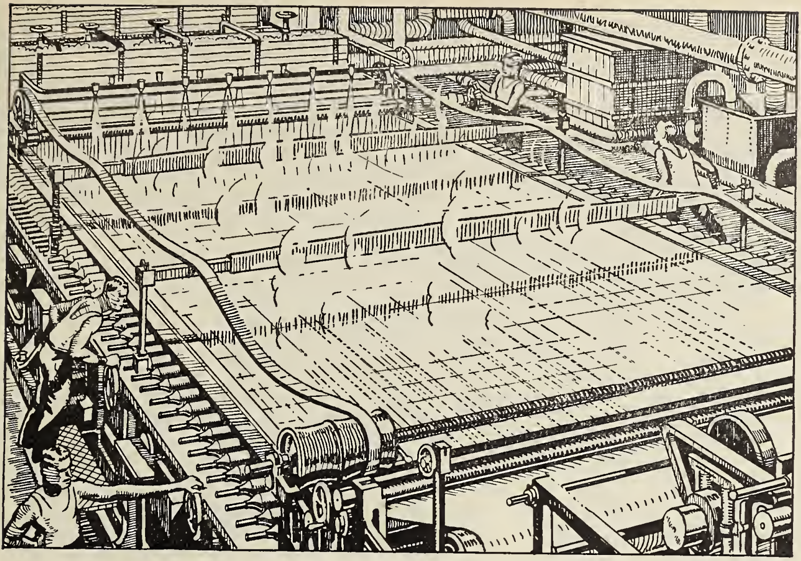
The pulps are taken away to machines which beat them very thoroughly indeed. The soupy liquid which was once grass or wood or rags is made to pass through rollers with teeth which grind every tiny piece of it.

When the pulp is being beaten, rag-pulp and grass-pulp and wood-pulp are mixed in the right way for making the kind of paper which is needed.

In the beating machines colours are added to the pulp if the paper is to be coloured.

When the pulp leaves the beater it is very smooth and soft, like cream. The little fibres are all broken apart from each other, and they float in the water with which the pulp is mixed.

Illustration—Beating the pulp in a beating machine.



Then, at last, everything is ready for making the paper itself. The pulp is taken to one end of a machine, and stirred in a great vat. Water is added until the pulp is very thin, and runs freely.

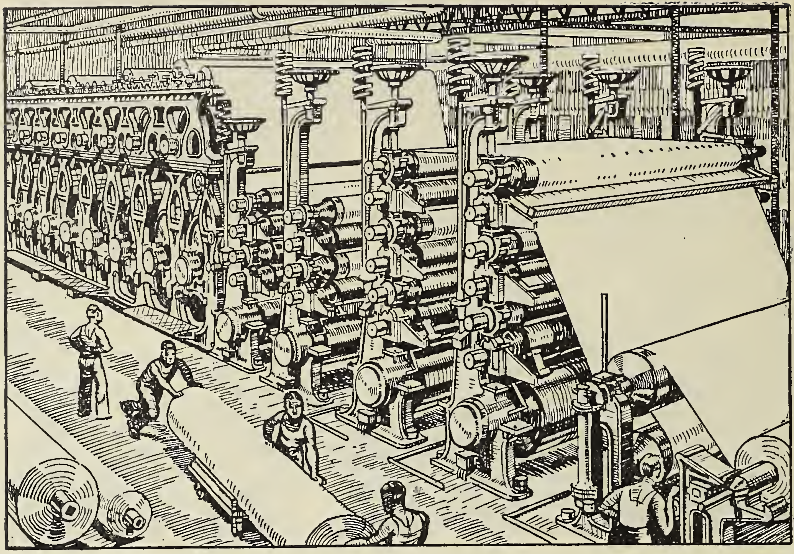
Then the pulp and water is poured steadily and evenly on a great band of fine wire netting. The wire netting, with the wet pulp on it, is moved along, and shaken from side to side, so that the water can drain away.

After it has gone a little way the pulp becomes drier, and begins to look like wet paper. It passes under a roller which makes it smooth and even, and then begins to wind in a huge ribbon over a great many large rollers.

Some of the rollers are hot, and as the paper goes on its journey, winding up and down among the rollers, it dries. When it comes to the end of the paper-making machine the change from grass, wood, and rags to paper is finished.

The paper is wound on a great reel, like a huge ribbon,

Illustration—The pulp becomes paper—the " wet end " of the machine.



perhaps ten feet wide and more than a mile long. Sometimes it is passed through special rollers which press it and make it smooth before it is wound on the reel.

But even when the paper is made, at the end of its journey through the machine, it is not yet ready for use.

Sometimes it has to be made shiny, and sometimes it has to be made hard. There are machines which unwind the reel of paper and dip it in a kind of glue. The machine then winds it about, over roller after roller, until it is quite dry, before it rolls the paper on a reel again.

There are many different kinds of paper. Some of them are soft and spongy, like blotting paper. But paper which has been given a bath of glue does not smudge the ink which is put on it.

Paper often has to be cut up into sheets before it can be used. There are many clever machines in a paper

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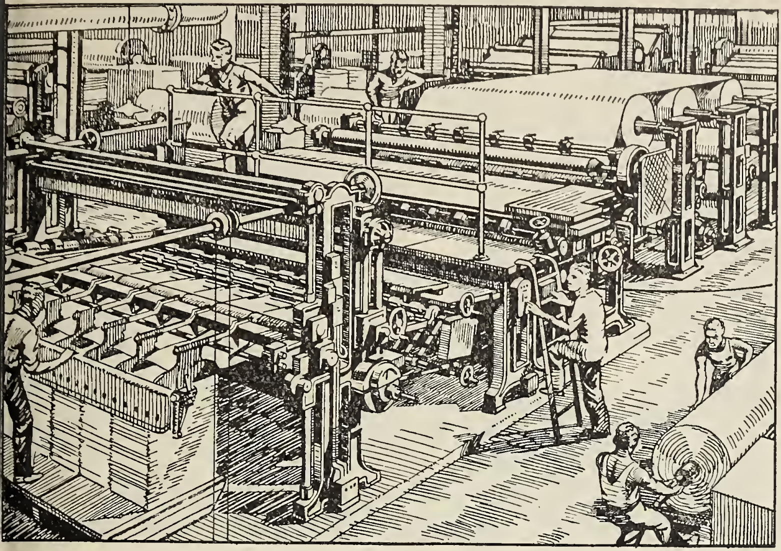
Illustration—The paper is dried and hardened—the "dry end."



mill to unwind the long ribbon of paper from the great reel, cut it into sheets, and stack the sheets neatly in piles.

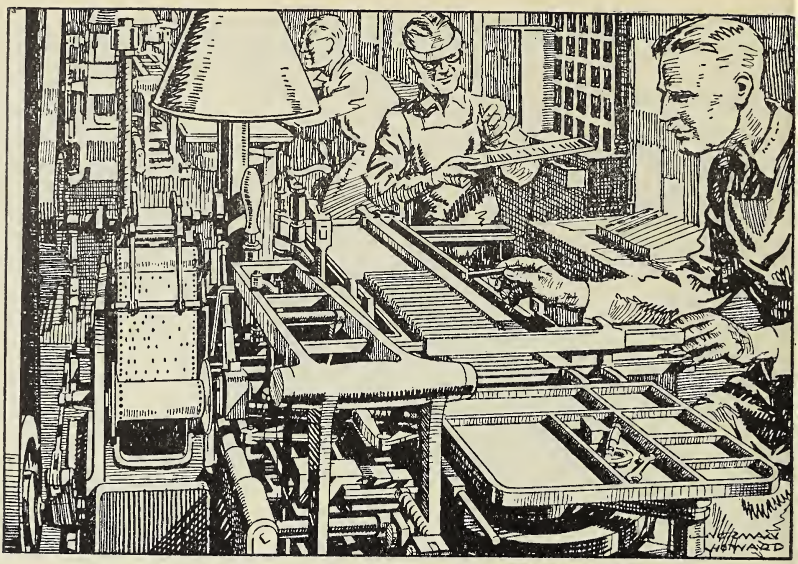
Last of all, the sheets of paper are examined, to make sure that they are perfectly good and clean, before they are counted and packed up to be sent away.

The paper goes away from the paper mill to be used for many different things, and a great deal, of course, is sent away to printers for making books and newspapers.

Printing is very important. It makes it possible for us to buy books and newspapers very cheaply, and it makes sure that every book printed at the same time is just like every other copy of the same book. In olden days, when every book had to be written out by hand, mistakes were often made in the copying.

Printing is done by setting up a great number of little pieces of metal, each with a letter cut on it, in lines, and

Illustration—Cutting the reel of paper into sheets.



paragraphs, and pages. Ink is put on the metal type, and then a sheet of paper is pressed on it. Where the metal stands up the ink leaves a mark on the paper, and those marks are the letters and words that you read.

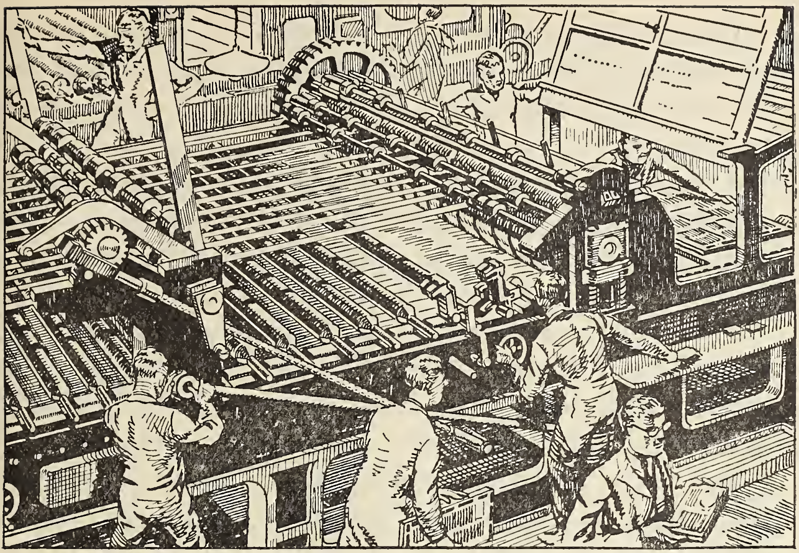
The printing is done by a big machine, which prints many pages at once, and inks the type and puts the paper in the right place all by itself. Some printing machines can print both sides of the paper as it passes through.

But before the printing machine can be set to work a great deal has to be done. The little metal types have to be arranged in just the right way to make words and sentences, and the proper spaces have to be left between the words.

All this work can be done by hand, as it used to be done when printing was first invented. But to-day it is nearly always done by a clever machine.

The words and sentences are written out by a keyboard

Illustration—The machine which makes the type (on the right). The paper ribbon is on the left.



just as they are written on a typewriter. And then the machine makes the little metal types, and arranges them in lines and paragraphs. It is a wonderful machine, for after the book has been ‘ tapped out ’ on a long paper ribbon by the keyboard it does everything else by itself.

When the words have been set up in type men arrange them in pages and put the pictures in their proper places.

The pictures are made of metal, too. The drawing that an artist has made, or a photograph, is transferred to a piece of metal so that the parts which are to be black stand up, just as the letters on the type do.

This is done in a very clever way. The drawing or the photograph is copied on the metal by a camera in such a way that some parts of the metal can be eaten away by acid, and some cannot. When the acid has eaten away the metal, only the parts of the picture which are to print in black are left standing up.

Illustration—Lifting the type from the printing machine.

When the book is ready in type it is taken to the printing machine, and everything is made ready for the printing to begin. Then the great machine is started.

At one end huge sheets of blank paper are fed into it, and at the other end printed sheets come out. The machine runs very quickly indeed, and may print two or three thousand books in an hour.

Newspapers are printed more quickly still, and the paper which is used for newspapers is fed into the printing machine, not in sheets, but in the long ribbon of paper which came from the paper-making machine.

The huge printing presses which make newspapers print them, cut them up, fold them, and count them all at the same time.

But books have to be folded and cut up into pages (for often more than a hundred pages of a book are printed at the same time) in other machines.

And, last of all, the folded book is bound up in its covers. The coloured pictures are put in with it at the same time.

Coloured pictures are printed in the same way as words, but they have to be printed several times, first in one colour and then in another, to give the bright picture that we see.

The coloured pictures in this book were printed three times. First, a yellow picture was printed on the paper. Then a red picture was printed over the yellow one. And to finish the work, a blue picture was printed over them both.

Printing goes on in every part of the world. Books and newspapers are printed in many different languages. In some the words begin at the right hand end of the line and run on to the left of the page.

In others the lines run down the page, from top to bottom. And many countries use letters that are very, very different from those we read and write.

But no matter what the letters, or how the lines run on the page, there is paper-making and printing to be done all over the world. And these are two of the most important of all the ways in which men work in the world to-day.

EXERCISES

PICTURES

Page 60. This is one of the machines which printed this book. What do you think each person is doing?

Page 62. What is the pulp made from? Why is it being beaten?

Page 63. What is pouring on to the wire netting? What happens after that?

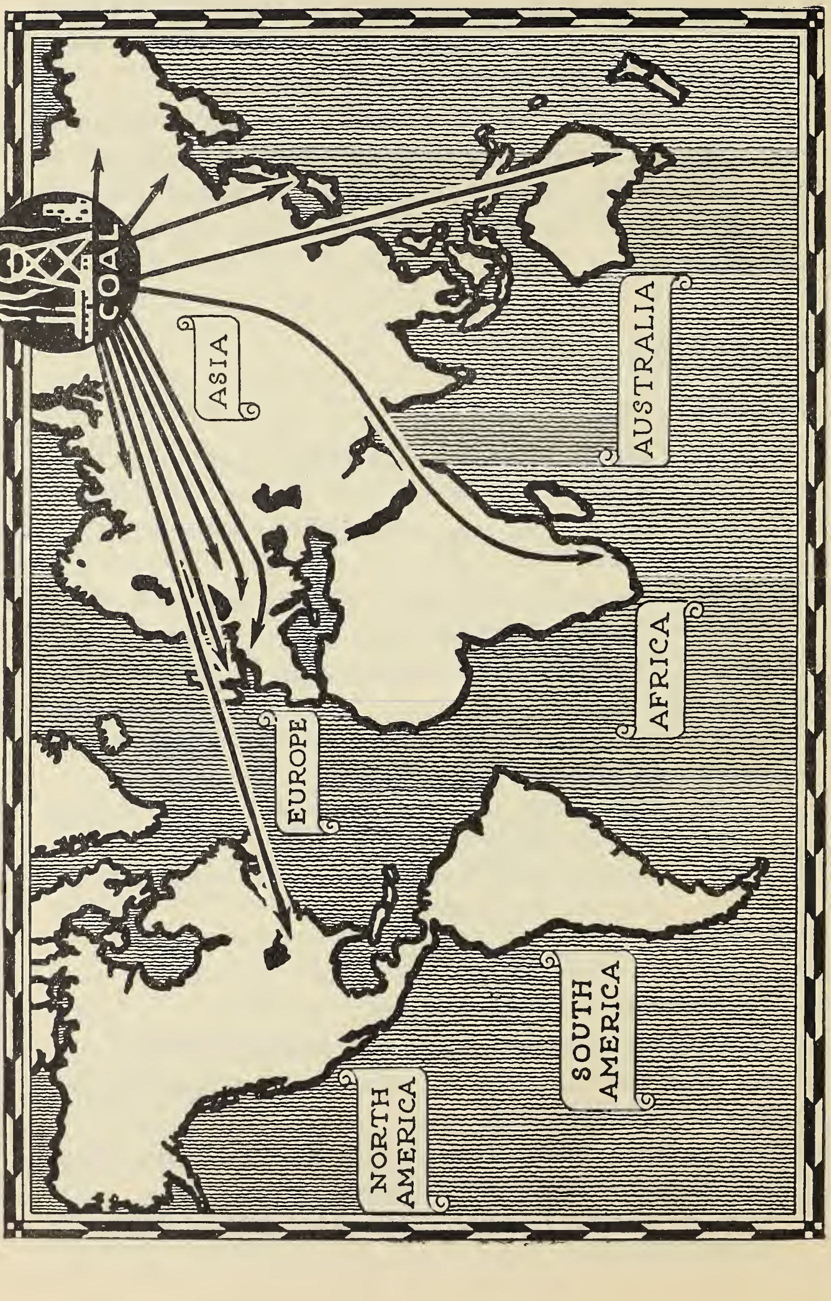
Page 64. Why are there so many rollers? What is being done?

Page 65. Can you explain why so large a machine is used for cutting up the paper?

Page 66. How would this work be done by hand if there were no machine like this?

Page 67. Explain some of the things to be done before the machine can begin to print.

1. Tell the story of a sheet of paper.
2. What do we mean by writing, and what by printing?
3. Say what you can about the making of the paper and the type used for this book.
4. Find as many kinds of pictures as you can in this book, and explain how they were printed.
5. Why has printing been called one of the greatest inventions in the world?


COAL
ASIA
AUSTRALIA
AFRICA
EUROPE
NORTH AMERICA
SOUTH AMERICA

COAL

MANY thousands of years ago men first found out how to make fire. It was a very important discovery, for it meant that they could keep themselves warm in cold weather, and could cook their food as well.

Wood was the fuel they burned, and they used their fires only for cooking and for warmth. Great furnaces such as we know in railway engines and factories were not thought of at all, and coal was almost unknown.

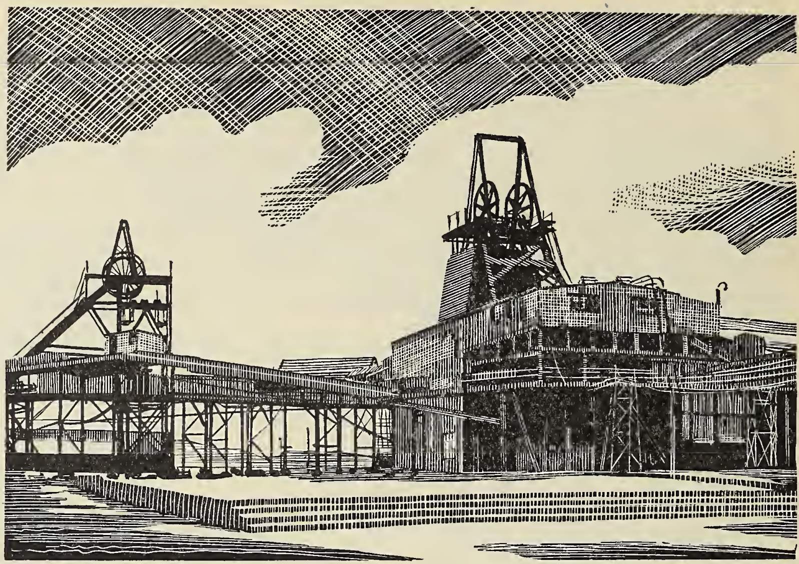
There was a little coal, to be sure, but it was picked up on the surface of the ground, and not dug out of deep mines, as it is to-day.

Six hundred years ago, when the traveller Marco Polo spoke of the " black stones " that men burned in their fires in China, the people of Europe laughed at him, for they knew nothing of coal.

And only two hundred and fifty years ago the coal that came to London was looked upon as quite a rare thing. It was called " sea coal ", because it was so heavy that it had to be carried by sea all the way from Newcastle.

Wood fires were used even for smelting iron. The wood was burned into charcoal and then used in the forges, because charcoal glows with great heat. Sussex, where a great forest stood, was the home of English iron workers in those days.

Then, about a hundred and fifty years ago, men found out how to use fire for driving engines and machines. Coal is far better than wood for driving steam engines, for it gives a hotter fire and is cleaner. Far less coal



than wood is needed, too, for a really good fire. And so men began to dig a great deal of coal out of coal mines.

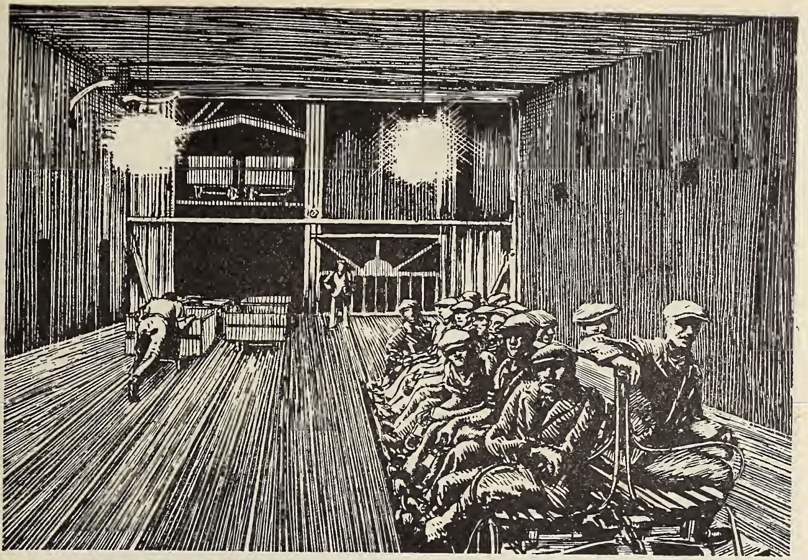
Factories and workshops were built near the places where coal was found. Many busy towns grew up near the coalfields of Durham, Yorkshire (near Barnsley), The Black Country (near Birmingham), South Wales, and Lancashire in England; and near the coalfield of the Clyde Valley in Scotland.

Factories and railways were built in almost every country of the world. And every country with coal fields dug coal mines, and began to obtain coal to drive the steam engines of the railways and the factories.

To-day there are coal mines and busy coalfields in nearly all lands where coal is found—in France, Belgium, Germany, in America, and in many other countries as well.

Coal is found in very many parts of the world, but while some countries are very rich in it, others are not.

Illustration—The pit head.



Countries which have plenty of coal sell it to the countries which have very little.

Coal is nearly always found in layers or seams below the ground. To get at it, mines must be sunk, and many, many men must work at hewing the coal, bringing it to the surface, sorting it, and carrying it away.

Above the ground there is not much to be seen, for almost all the mine, and the work, is out of sight deep under ground.

All that is above the ground is a great wheel at the pithead (by which cages are hauled up the shaft, or lowered down), some buildings for the engines, many railway trucks to carry away the coal, and great heaps of stones and earth which have been separated from the good coal. These heaps are called " tips ".

Every mine has a shaft, in which the cages pass up and down, carrying men to and from their work, and

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Illustration—At the bottom of the shaft.

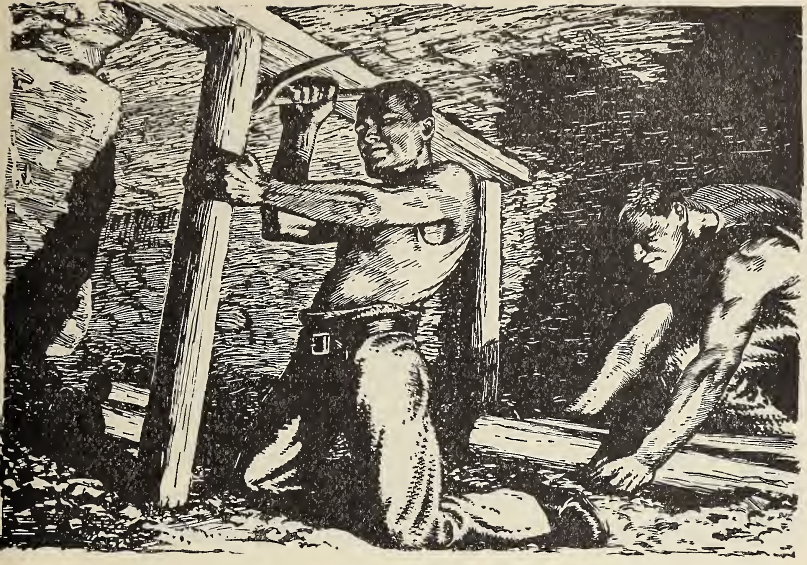
raising the coal that they hew from the black face of the seam.

Underground there run long passages, or galleries, from the shaft to the coal face, and along these galleries the coal is carried in "tubs" to the cages that bring it to the surface. Sometimes the tubs are pulled by ponies, and sometimes they are hauled, like little trains, by electric engines.

Down in the galleries and passages of the mine it is very dark, of course. In many of them lights are fixed. But near the coal itself, where the miners work at hewing the coal from the solid rock, each man has to carry his own lamp.

A miner's lamp is a very special lamp, for down in the mines there are gases that may very easily explode or catch fire if a flame touches them, and the miner's lamp must be made so that there is no danger of such a fire or explosion.

Illustration—Winning the coal from the face of the seam.



The miners go along the galleries to their work, and there they pick away the coal from the seam. And as they hew the coal they slowly make the galleries longer and longer.

Sometimes the coal has to be blasted away. Holes are cut in the wall of coal, and little tubes of explosive are buried in it. Wires are led out, and the men go to a safe place.

Then the charges are fired, and the coal is broken up by the explosion. The miners go back, the coal is loaded on tubs to be taken away, and the men begin to hew the coal again.

As the coal is dug out, and the galleries go farther and farther into the earth, great care has to be taken to hold up the walls and roofs of the passages.

Men fix pieces of timber, called "pit-props", to keep up the roofs and the sides of the galleries. Others lay the rails on which the trucks, or tubs, will run

Illustration—Fixing pit-props.

as they carry the coal to the shaft, to be hauled up to the surface above.

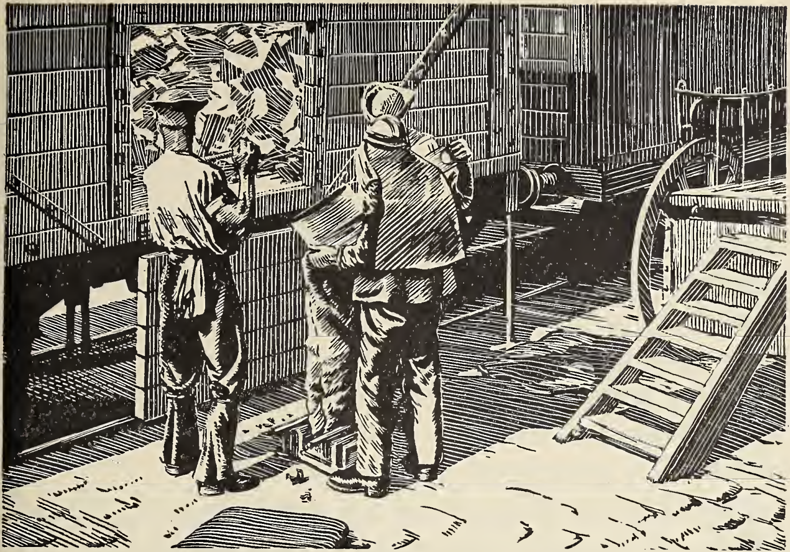
Many mines stretch for miles and miles underground. Some, indeed, run far out under the sea. And it often takes a long time for the miners to go from the shaft, where the cages go up and down, to the coal face where their work is done.

It is very important for the men who work there that the air in the mines should be good to breathe. Small shafts are cut from the galleries to the open air, and pumps are put in to make sure that plenty of fresh air is pumped into the mine.

Even so it is always rather hot in a coal mine, for the deeper we go down in the earth the hotter we find it. And so the men who work at the coal face wear few clothes, for not only is it hot but the work they have to do is very hard.

The cages in the shaft bring the coal up to the surface.

Illustration—Sorting the coal.



They must travel very quickly, because it is important to save as much time as possible. Once the coal has reached the pit head it is sorted and the best coal picked out, for small and dusty coal is worth far less than large pieces.

The sorting is often done by machinery, and the coal is then loaded on trucks standing ready on the railway near the pit head, to be carried away to factories, docks, and coal merchants.

There is a great difference between the various kinds of coal. Some of it is hard, and gives a great deal of heat, with very little ash and little smoke. This is often called " steam coal ", and is greatly used in ships and factories.

Some coal is soft, and burns slowly, leaving more ash and cinders. It is used when smoke and ashes do not matter much and can easily be cleared away.

The cages in the shafts bring the miners to the surface

Illustration—Unloading coal trucks.

after their day's work. When they come up they go to the lamp room, where they hang their lamps, and then on to the dressing rooms, where they wash themselves and change their clothes, for coal mining is very dirty work.

Britain is very rich in coal, and ships from the ports of Durham, Yorkshire, and South Wales carry coal across the seas to other countries which have little coal of their own.

Many ships, too, are driven by coal, and so there are "coaling stations" in far-off parts of the world to which ships carry the coal that is to be used by other ships which carry passengers and cargo.

Port Said, in Egypt, is a place where ships are loaded with coal, although there is not a single coal mine in all Egypt. Aden, on the edge of the great Arabian Desert, is another coaling station to which coal is brought from the busy mines of Europe.

To-day fewer ships are driven by coal, for oil is cleaner and more convenient to load. There is a great deal of dirt and dust and bustle when a ship is loaded with coal, but oil is taken on board, cleanly and quietly, through large pipes.

A great deal of coal is used for making gas. Gas is very useful for light and heat, and in the making of gas many other useful and valuable things are made as well.

The dyes which give us beautiful colours often begin to be made in the gas-works. Tar for roads and boats, and coke for fires and furnaces are other things which come from coal when gas is made.

But the chief use of coal is for driving steam engines in factories, ships, and trains. Even electric trains may really be driven by coal, for coal is often used in making the electricity they use.

To-day, however, many other ways of obtaining power are being found and used. Countries which are poor in coal get power for their railways and their factories in other ways, and so do not have to buy much coal from the great coal countries.

Yet coal is still very important almost everywhere in the world, and many men, in Europe, America, Africa, Australia, and Asia, must work at mining, or loading, or using it.

EXERCISES

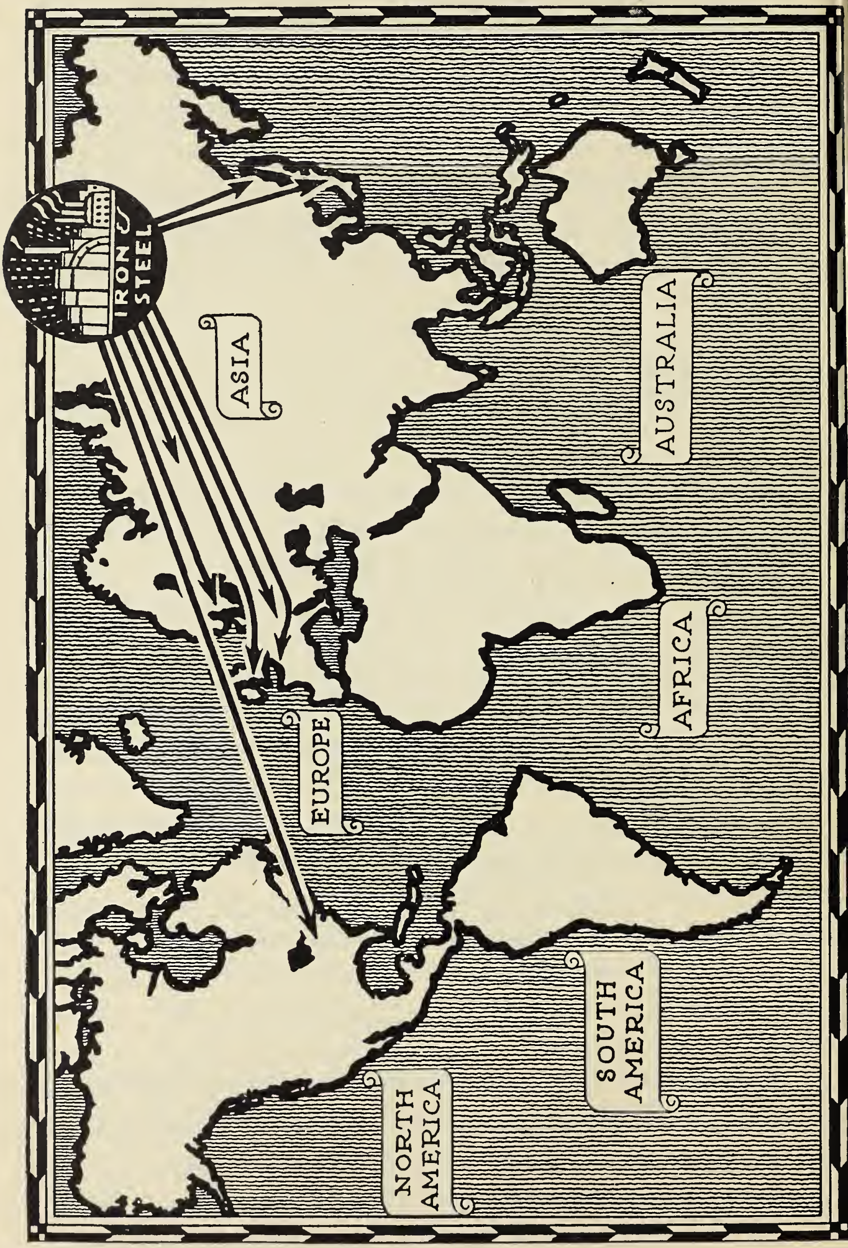
PICTURES

Page 72.	Explain this picture of the top of a coal mine.
Page 73.	Explain this picture of the bottom of a coal mine.
Page 74.	What does this picture show you ?
Page 75.	What are these men doing ? Why ?
Page 76.	Why must the coal be sorted ?
Page 77.	How is the coal taken from place to place ?

MAP

Page 70.
1. Compare this map with the one on page 80.
2. Which lands produce coal ?
3. Name some of the countries which must buy coal from other lands because none is found in them.

1. Say what you can about coal and the things we get from it.
2. Give an account of a miner's work. What are " pit props " ?
3. Find out what you can about the miner's lamp.
4. What are coaling-stations ? What is their work ? Where do you expect to find them ?


IRON & STEEL
ASIA
AUSTRALIA
AFRICA
EUROPE
NORTH AMERICA
SOUTH AMERICA

IRON AND STEEL

COAL has many uses. It provides power for driving ships, trains, and engines. It gives heat and light in the form of electricity and gas. And it is very, very important for making iron and steel.

Iron is found in a kind of stone—or rather a *mineral*—called iron-ore, which is dug out of mines. Iron-ore is nothing like the iron which we use, and many things have to be done before machines, rails and bridges can be made from the iron which is in it.

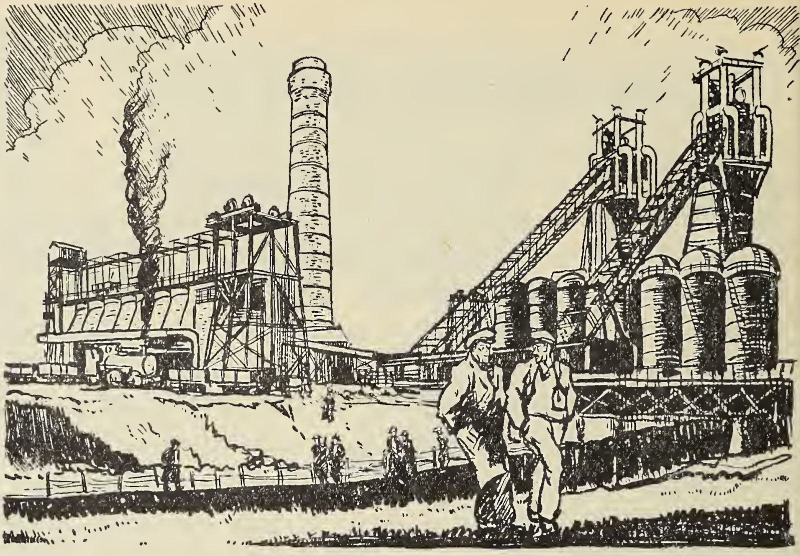
The iron-ore is first made red hot, or 'roasted', as it is called. This is done not only to get rid of some parts of the ore, but to make it easier to get pure iron from it.

Then the iron-ore is smelted. It is mixed with coal and coke, and other things such as limestone are added. The mixture is burned in a great furnace until the iron is free from nearly all the stone and other things, and becomes molten.

Great care is taken to choose things to mix with the ore which will help to make the iron clean and pure when it melts. After the smelting is done the iron flows out of the furnace in a great, white-hot, glowing stream of molten metal.

The heat needed is so great that the burning coal and coke are not hot enough by themselves, and a great draught of air is blown through the red hot furnace of coal and iron to make it hotter still. Because of this, the furnaces are called blast furnaces.

A great deal of coal and coke is needed to smelt the iron-ore. In fact, more coal is used than iron-ore, so



that it is cheaper to bring iron-ore to the coalfields than to carry coal to the iron mines.

For this reason ironworks are almost always near great coalfields. In Britain, there are great ironworks in the Clyde Valley, in Durham and North Yorkshire, in the West Riding of Yorkshire, in the Black Country, and in South Wales.

These areas are all great coalfields, and in many of them iron-ore is also found. But better iron-ore is found in some lands far off across the sea, and so ships bring iron-ore from Sweden to the British coalfields, for it is cheaper to bring Swedish iron-ore to Britain than to carry British coal to Sweden.

So, too, there are great ironworks on the coalfields of America, near the city of Philadelphia : in Germany, in Poland, in Belgium and in France.

To some of these ironworks iron-ore comes by water, in ships over the sea, or in barges along rivers and

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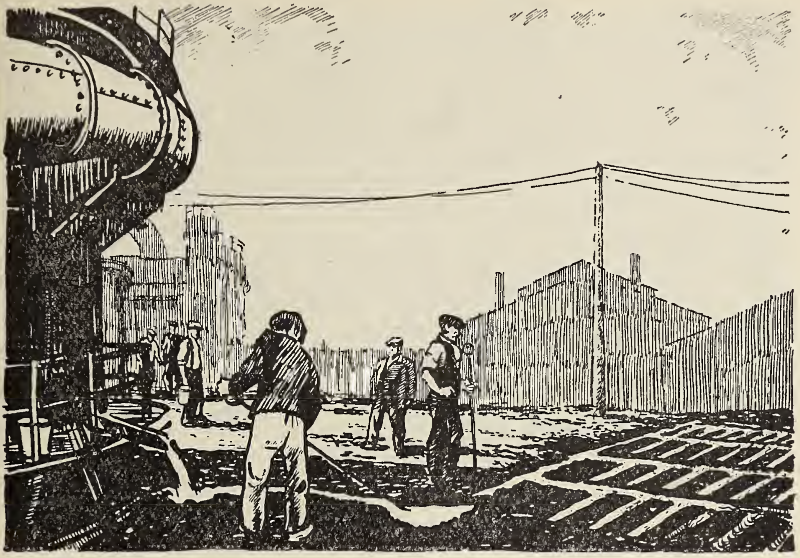
Illustration—An ironworks.



canals. To others it comes in long goods trains.

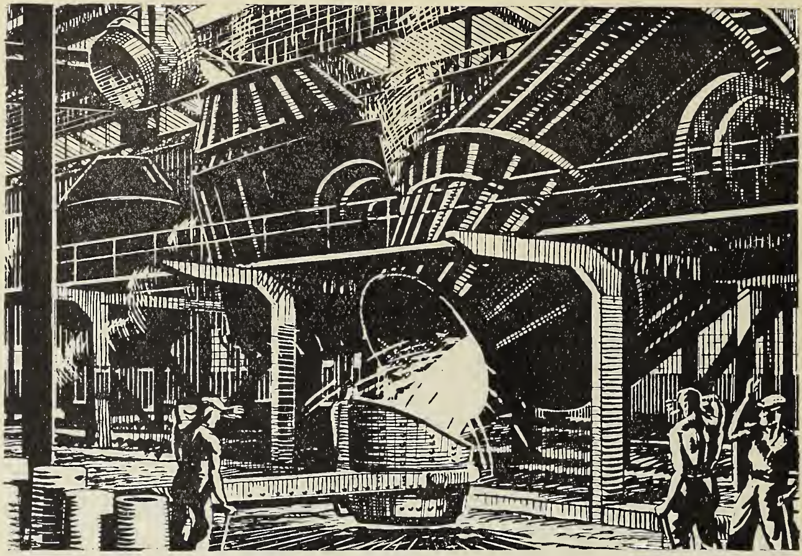
After the iron has been smelted these trains, barges, and ships carry it away again. But iron is very heavy, and so the factories, or mills, which make things from iron are all as near as possible to the coalfield and the ironworks, so that coal and iron have to be carried only a short way to them.

A blast furnace, where iron is smelted, is a smoky, dirty place. Showers of sparks fly up, and at night a red glow from the tops of the furnaces lights up the sky all around.

Many men work in the smelting works. It is very hot, and the work is hard.

Some of the men have to see that the white-hot, liquid iron, when the furnace has done its work, runs out into the moulds, or shapes, scooped out of sand, that are ready for it. The iron cools in these sand moulds and forms rough bars of iron, called pig-iron.

Illustration—Pouring the smelted iron into moulds.



The pig-iron is sometimes heated and melted again, and then allowed to cool in other moulds, to make what we call cast-iron. Cast-iron, though it is very hard, breaks easily, for it is brittle. Sometimes the pig-iron is heated and worked to make wrought-iron, which, though it is hard and strong, can be bent and shaped.

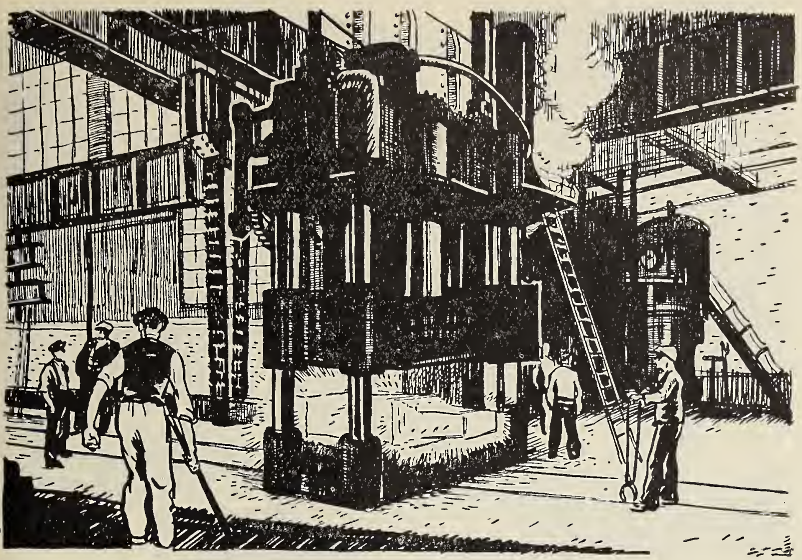
Many other kinds of iron are made, some for making extremely hard plates, and some for making fine wires which can be tied in knots without breaking.

Again, pig-iron can be made into steel, which is even harder and stronger than iron, and can be made very sharp indeed.

When steel is made hot, and then put suddenly into cold water, it becomes still harder, and can be used for knives, chisels, and all kinds of cutting tools.

Steel is a very wonderful thing, and it is very important indeed for making motor-cars, railways, aeroplanes, and engines of all kinds.

Illustration—Pouring steel from a furnace.



Steel is nearly pure iron, purer even than pig-iron, to which a very little carbon, and sometimes a very little of some rare metals, has been added. It can be hammered, rolled, stamped or drawn into all kinds of shapes.

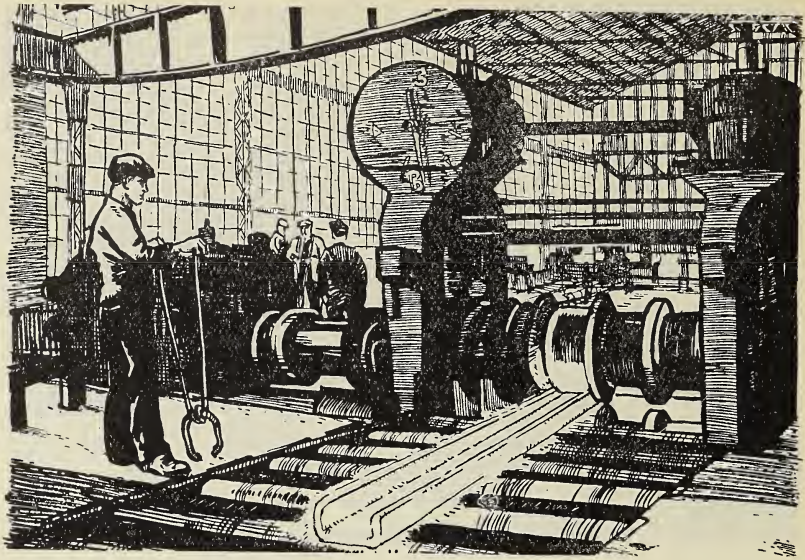
To make steel the pig-iron is heated again until it is molten, and runs almost like water. Then it is mixed, sometimes by men who work it with long bars of iron on an open hearth, and sometimes in a great furnace where it gives out a fiery shower of sparks.

The steel is run off and cast into bars, just as the pig-iron was cast. Then it is taken away to the mills to be made into many different things.

Great steam hammers beat out blocks of white-hot steel into many useful shapes.

There are many kinds of steel, and each kind has to be made very carefully for the work it is to do. Care is taken in mixing the iron to make just the kind of steel which is wanted.

Illustration—A steam hammer at work.



Some kinds are useful for armour plates for protecting battleships, for guns, and rails for trains to run on. Some kinds are light and strong, and are used in making the engines of motor-cars and aeroplanes.

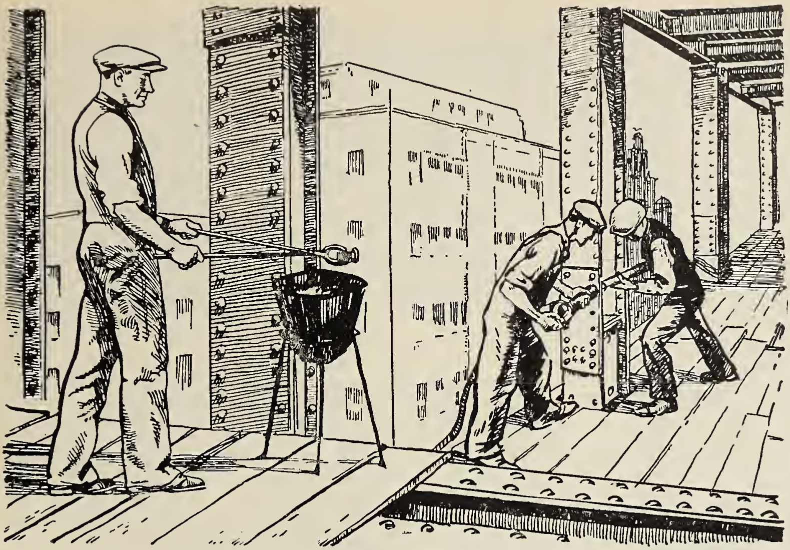
Another kind will not rust. And there is the wonderful steel from which cutting tools are made, a steel which can be made to cut other kinds of steel as easily as if they were as soft as cheese.

The steel is taken away to the rolling mills, where it passes between great rollers and is squeezed into long thin strips, rods, rails, or girders.

After the rolling everything depends on what the steel is to be used for. In Sheffield much of the steel is made into sharp things, such as knives, razors, axes, and chisels.

In the Clyde Valley it is rolled into plates ready for ship-building. In Durham and Yorkshire it is made ready for the building of engines of many kinds.

Illustration—Rolling a girder.



In South Wales very little of the iron is made into steel. Most of it is rolled into thin sheets and coated with tin or other metals to give us the "tin-plate", as we call it, from which men make the tins in which soups, meat, fruit, and other kinds of food are packed.

Iron and steel are made in many countries all over the world. Some of the steel is used for railways, some for ships, some for knives, and some for machines. For some things hard cutting steel is used, and for others the softer iron.

Iron is used for building, too. Many buildings to-day are made from concrete on a framework of steel. Steel girders hold up the building, and the walls are made from concrete plastered round a network of steel.

Not only are men busy finding new uses for the kinds of steel we have, but they are busy also discovering how to make even more useful kinds of steel.

Illustration—Riveting the framework of a building.

Wherever iron-ore or coal is found, wherever iron is smelted, and iron and steel goods made, there is work for very many people.

And when we think of all the things that are made from iron and steel, and of the many people all over the world who use them, we shall not be surprised to find that this metal, in one way or another, enters into the daily life and work of almost everybody.

EXERCISES

PICTURES

Page 82. Name the things used in a blast-furnace. Why is it given this name?
Page 83. Explain this picture, and point out the pigs in it.
Page 84. What are these men doing?
Page 85. What is being done to the block of white-hot steel?
Page 86. How is this steel girder being shaped? Name other things which can be shaped in the same way.
Page 87. Explain what each man is doing, and why.
Page 89. How are the plates of steel fixed together?

MAP

Page 80.
1. Make a list of the chief countries in which iron is found.
2. Compare this map with the one on page 70 and find which countries have coal also?
3. Why does Sweden send iron ore to other lands, such as Britain?

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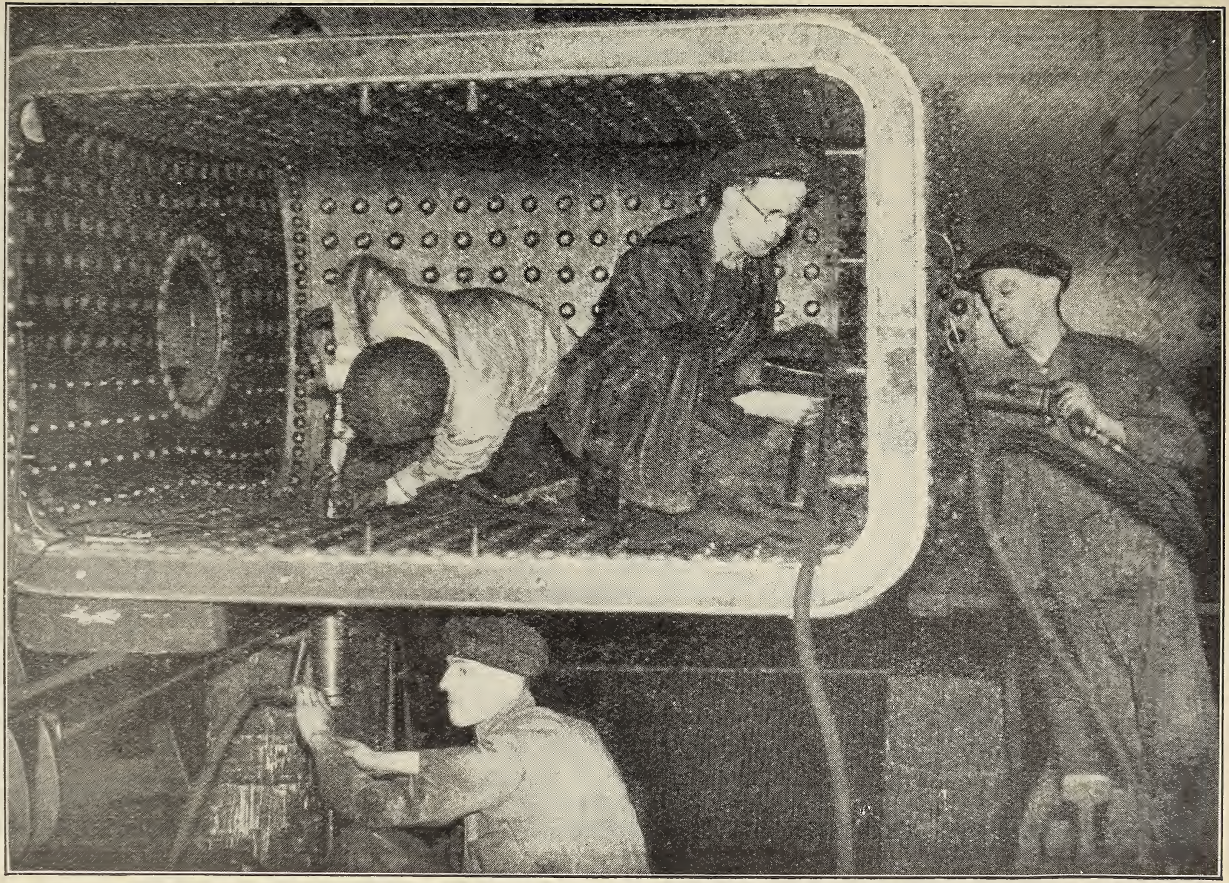
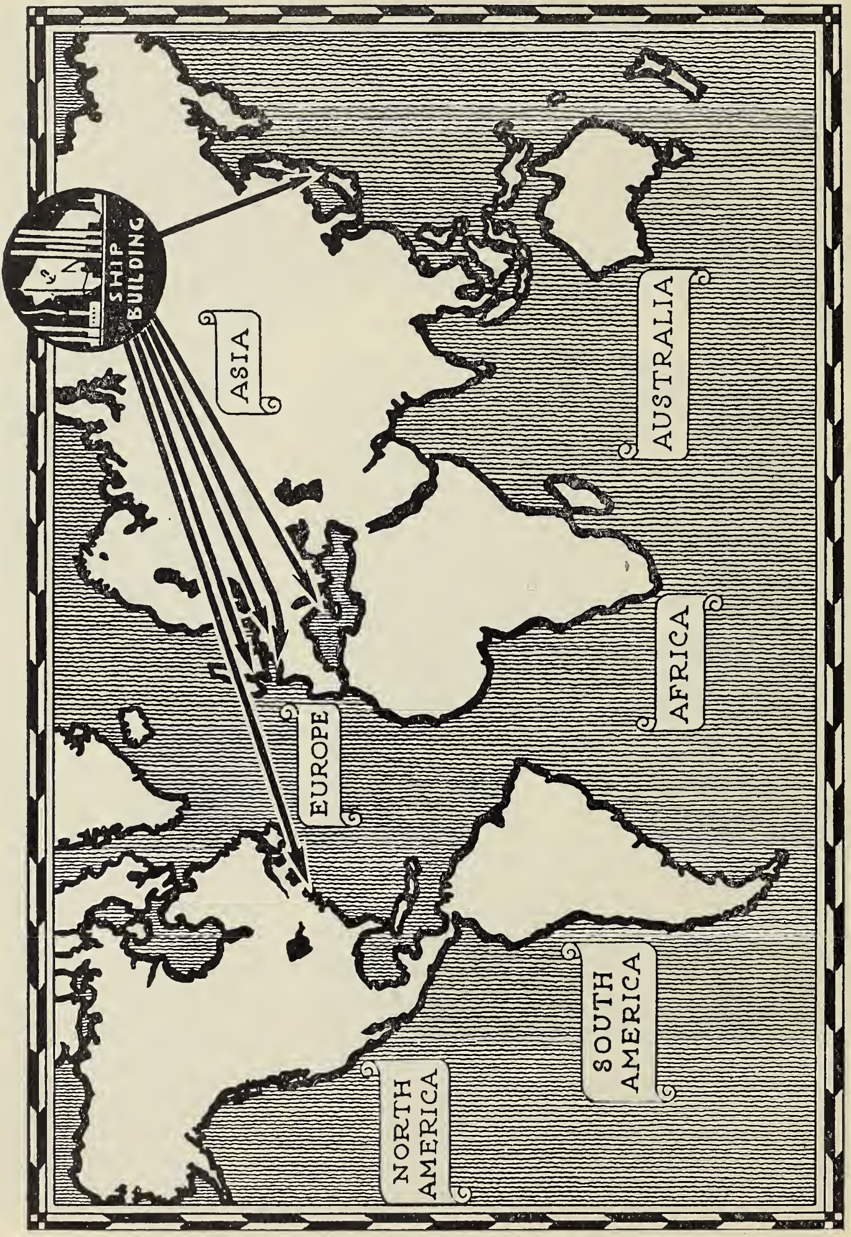
1. Why are iron and steel works very often near coal-fields?
2. How do we get iron from the iron-ore?
3. Collect some pieces of iron, steel, and tinplate, and say what the differences between them are.
4. Say what you can about pig-iron, cast-iron, steel, stainless steel, and wrought-iron and tin-plate. What is each used for?
5. How is steel used in building, and in making roads?




SHIP BUILDING
ASIA
AUSTRALIA
EUROPE
AFRICA
NORTH AMERICA
SOUTH AMERICA

SHIPBUILDING

NOT much more than a hundred years ago every ship was built of wood, and was driven by the wind. Timber was used for the hull, canvas for the sails, and, of course, many, many ropes of all kinds.

Ships were built near forests of the oak trees from which their timbers were made, and they had, of course, to be built beside the water. In England many ships used to be built at Southampton and Portsmouth, near the New Forest.

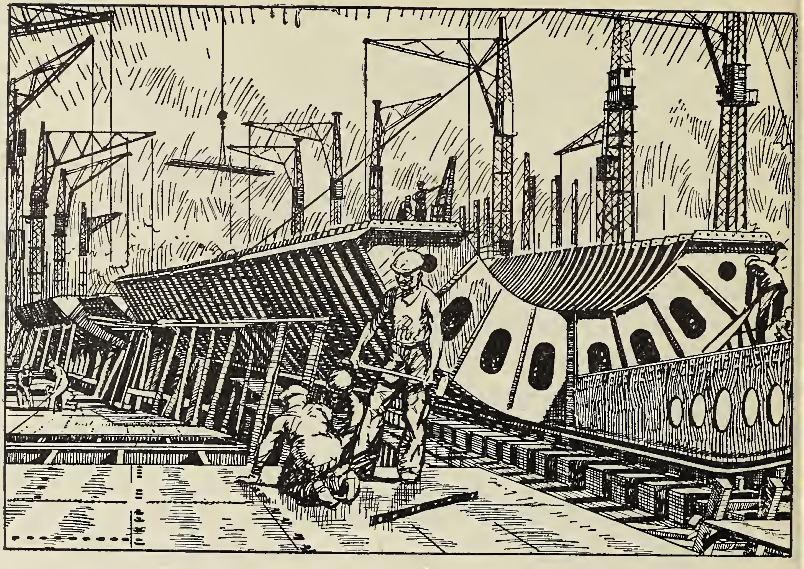
Then, about a hundred years ago, men began to use steam engines to drive ships, and they thought of building ships of iron. At first people laughed, and said, ‘ Everyone knows that iron can never float.’

But iron ships did float, and what is more, steamships travelled more quickly than sailing ships. Shipyards grew up in many countries for making and building them and their engines.

Iron is heavy, and so is the coal for smelting the iron and driving the machines that are used in building the ship. So shipyards grew up beside the water in places near coalfields and ironworks.

It would not do to build a shipyard on the sea coast itself, because a great deal of the work has to be done while the ship is floating in the water, and the sea is often stormy.

Shipyards are built on the banks of great rivers, where the water is deep and calm. In this country the great shipbuilding districts are on the river Clyde, near the great Scottish coalfields and ironworks ; on the rivers



Tyne and Tees, near the iron and coal of Durham ; and at Barrow-in-Furness, Dundee, and Swansea. Belfast, in Northern Ireland, has great shipyards, too.

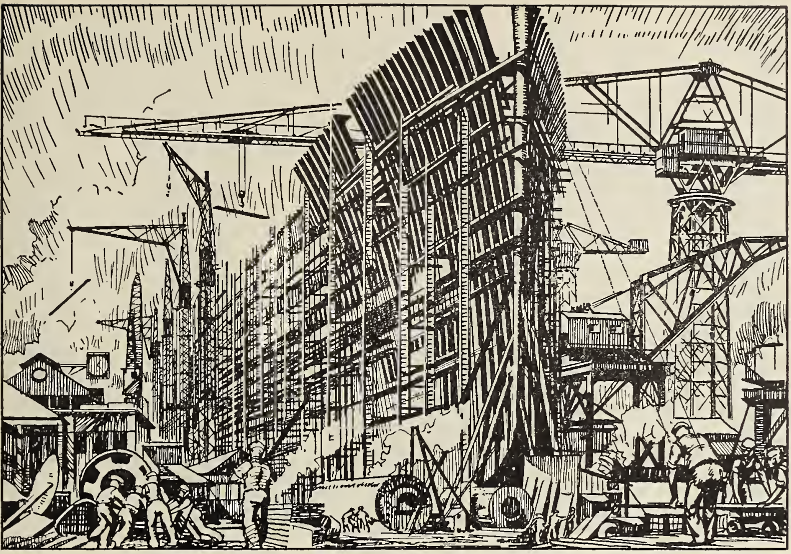
To-day it is not iron, but steel, that is used for ships and their engines. The shipyards are always near big steelworks, for a great deal of steel is used in building a ship.

First of all, the ship is built on dry land. It is 'laid down' on a part of the river bank which slopes towards the water.

The backbone of the ship, its keel, is made from steel girders riveted together. Then more steel girders are used to build up its ribs. And last of all the hull is made by riveting a strong skin of steel plates over the ribs, and then the whole ship begins to take its proper shape.

There is a great deal of work to be done in the building of a ship's hull. The steel has to be rolled out and cut into plates. The plates have to be drilled with holes

Illustration—The ship's keel being built.



and lifted into position ready to be fastened together with rivets.

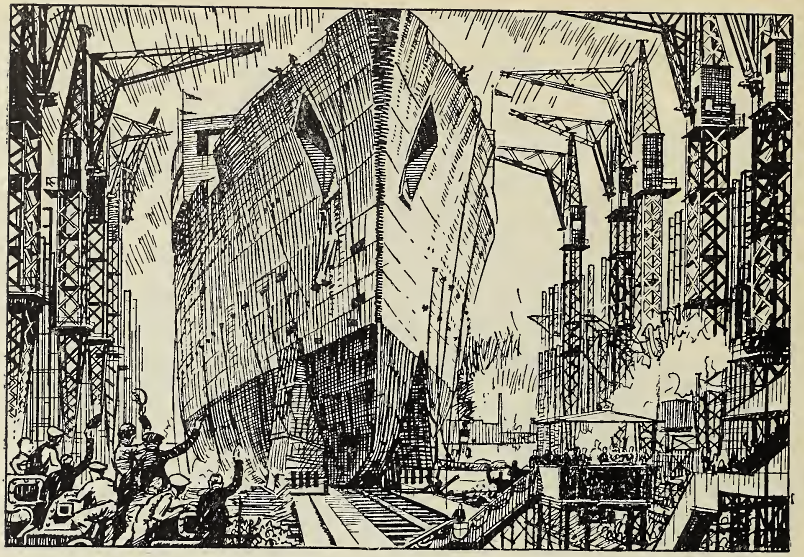
Rivets are red hot pieces of steel put through the holes and hammered flat at each end, so that when they cool they hold the whole skin of plates tightly together.

The noise of the riveting machines is loud and harsh, but the people of the shipbuilding districts love to hear it, because it means that there is plenty of work in the shipyards.

Sometimes the plates are not riveted, but welded together. This means that they are softened by heat and then hammered or pressed together. To weld steel a very hot flame is needed, and the work must be very skilfully done.

While the hull is being made the decks and a great deal of the rest of the ship are built, too. The rudder and the propellers are put into place, and the anchors and their chains lifted on board.

Illustration—The building of the ribs.



Then all is ready for the ship to leave the slipway where she has stood for so long on dry land. The way to the water is built like a giant railway for the ship to slide down on her way to the water.

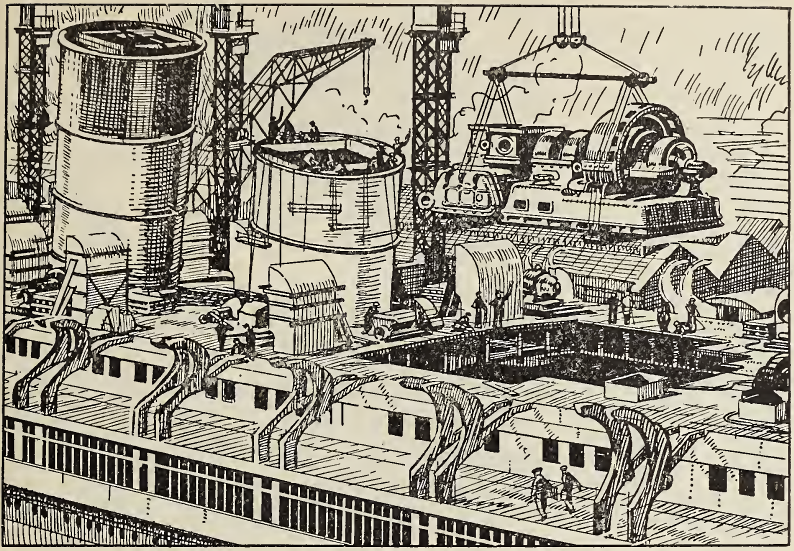
The launch of a big ship is a great event. It is then that she is given her name, as a bottle of wine is broken against her bows.

All the props and supports are removed. She is released, and slides slowly down the ways. Faster and faster she goes, until, with a splash, she takes the water for the first time.

After the ship has been launched a great deal more work has yet to be done. The engines have to be fitted in the hull, and all the decks, holds, and cabins for passengers finished.

The engines are built of steel, like the hull. If the ship is driven by steam there are boilers and furnaces to be built. There are bunkers for ships driven by coal,

Illustration—The ship glides down the ways.



and great tanks for oil-burning ships, to be made.

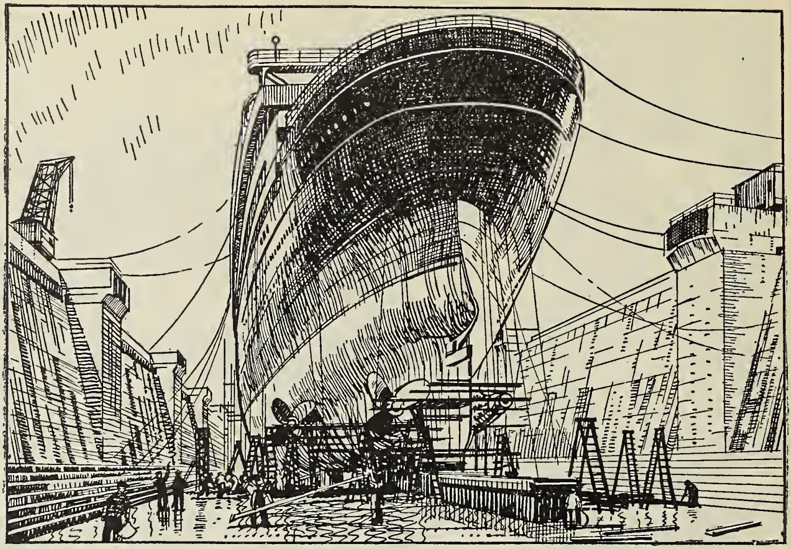
Sometimes ships are driven by engines which use oil, just like the engines which drive many of our motor buses, but many times bigger and more powerful. These engines need great oil tanks, but no boilers.

When at last the ship is finished she is taken out to sea for her trials, to find out how fast she can go, and to prove that she is a good ship.

After the trials the real work of the ship's life begins. She sails from port to port across the ocean, carrying passengers from place to place, or goods of many kinds from the countries where they are made to the countries where they are wanted.

Ships have very different work to do. Some of them are built to travel as swiftly as possible with passengers and mails. Others have to carry food, coal, steel, or the many things made in factories, to far-off lands.

Illustration—Lifting some of the ship's engines aboard.



Many of the ships which carry such food as beef and mutton have large cold rooms in which the meat is kept during the voyage. In these cold rooms it keeps quite fresh and good to eat, although the ship may travel through the hottest parts of the world.

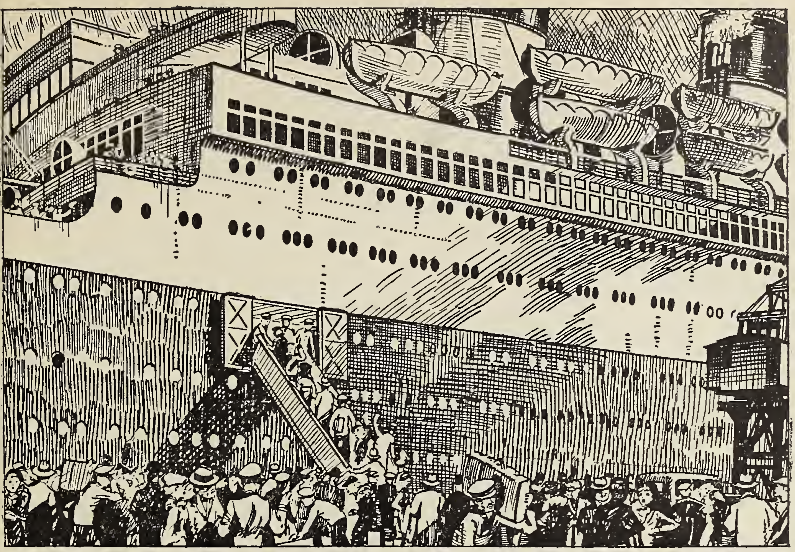
But no matter what work ships may do there must always be ports, with harbours and docks for loading and unloading them.

And in many ports there are dry docks, where ships can be cleaned and repaired after the water in the dock has been pumped away.

It is important that ships should lie in smooth water when their cargoes are being loaded, and so docks and wharves are always built in places where the water is sheltered from the sea.

Some of these sheltered places are on the mouths of rivers, where the winding of the river breaks the force of the sea waves. Some of them are in bays and

Illustration—A big liner in dry dock.



openings of the sea, where arms of land help to keep out the rough water.

Nearly all the ports to which ships come, and from which they sail on their long voyages, have long quays where the ships are loaded and unloaded. And beside all the quays there run roads and railways, bringing goods to the ships, and taking other goods away.

The ports are not always near the great shipbuilding areas. Ports are places for trade, and their docks and harbours are built near busy towns and fertile farms.

London, Southampton, Glasgow, and Liverpool are the greatest ports of Britain, and only one of them, Glasgow, is also a place where ships are built.

And in countries across the seas very few great ports are near shipyards. Bombay, Calcutta, Singapore, Cape Town, Shanghai, Sydney, though they are very busy seaports, have no shipyards.

Ships are built in places where coal, steel, and skilled

Illustration—A great liner at the quay side.

workmen are to be found near the sea coast, but they ply and trade between the ports where the goods that they carry are made and consumed.

So it is that ships built on the Tyne and the Clyde often ply between the ports of far-off lands a long, long way from England or Scotland.

EXERCISES

PICTURES

Page 92. Explain the first steps in building a ship.

Page 93. Here is the framework. What is the next thing to be done?

Page 94. Why is this a great day in the life of a ship?

Page 95. Tell the story of a ship's engines.

Page 96. Why is this called a dry dock, and what are its uses?

Page 97. Describe some of the ways in which a ship is loaded.

Page 99. Name some of the things which have still to be done to this ship.

MAP

Page 90.
1. Look at the maps at the end of the book and then name the chief countries which build ships.
2. Look also at the maps on pages 70 and 80, and try to explain why the arrows so often point to the same countries.

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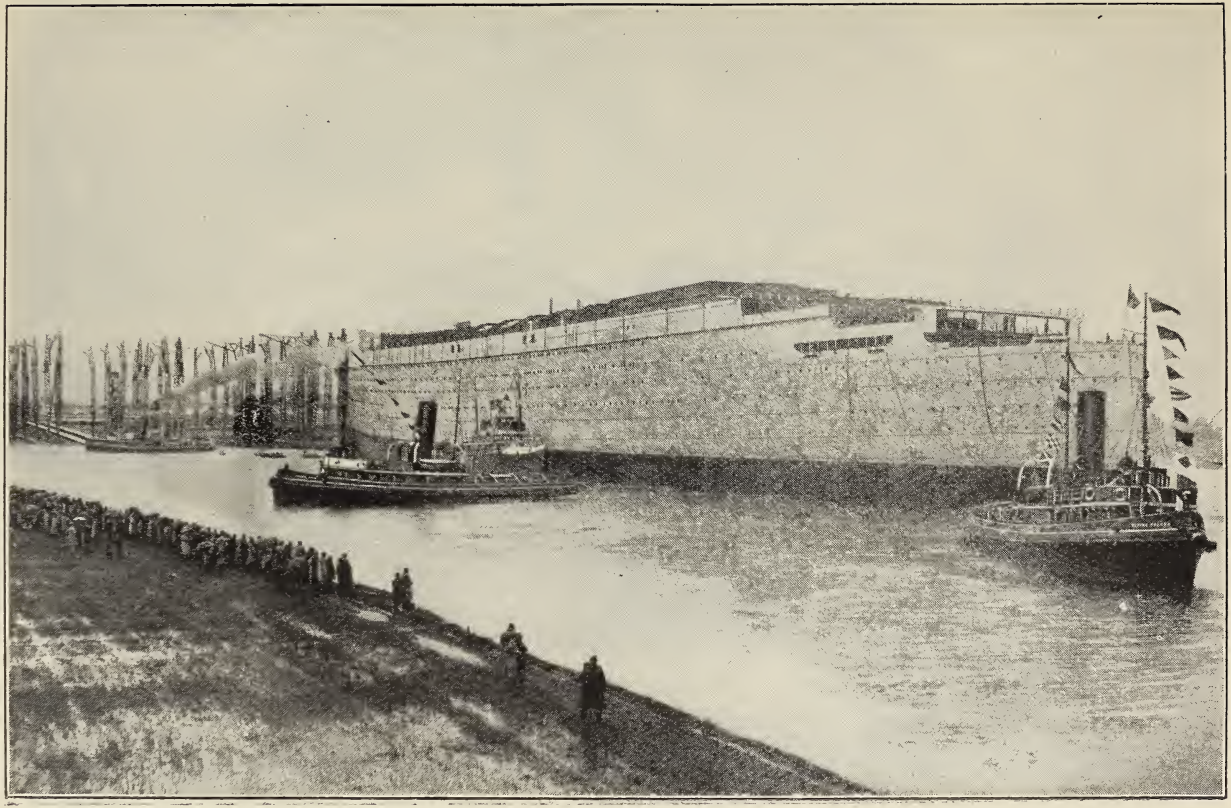
1. Tell the story of the building of a ship. When is she launched?
2. Explain the work done by a ship, and what she needs at the ports she visits.
3. Make a drawing of a wooden sailing ship, and of a big liner.
4. Collect pictures of ships, and note the work each one does.



ELECTRICITY

ELECTRICITY is one of the most wonderful things in the world. It lights our houses and streets, warms our rooms, and drives trains, trams, and all kinds of machines. It gives us telephones and wireless, and so carries our messages to every part of the world.

But while electricity can do all these things, it cannot be seen, and takes up no room at all. It travels from place to place, either along wires or in wireless waves, very, very swiftly, and it can be turned on or off with a simple switch.

Electricity can give us light, heat and power for driving engines just as well as coal or oil.

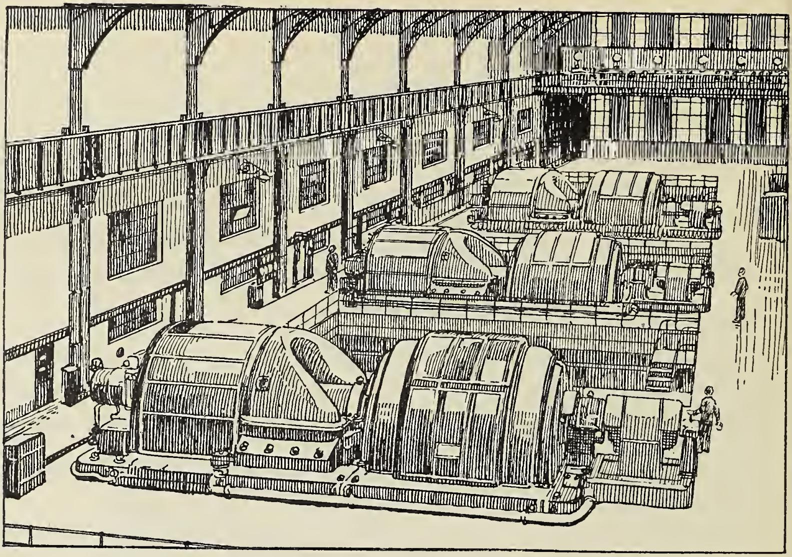
Coal and oil need ships, railways and lorries to carry them from the places where they are found to the works where they are used, and men to load and unload them.

Electricity needs nothing but wires to carry it from the place where it is made to the place where it is used, and there is no need of men to load it on the wires, or unload it from them. A switch does all that is necessary.

Electricity does not have to follow the windings of roads or railways or rivers on its journeys, like heavy things which must be carried in trucks or ships.

Wires lead away from the places where electricity is made—the power stations, as we call them—and take the shortest way, climbing over the hills, and crossing the valleys in a mighty sweep.

In the power stations huge dynamos spin hour after hour without slowing or stopping.



The halls in which the dynamos do their work seem large and empty. Very few men are needed to look after these mighty machines, and they seem to turn and turn almost by themselves.

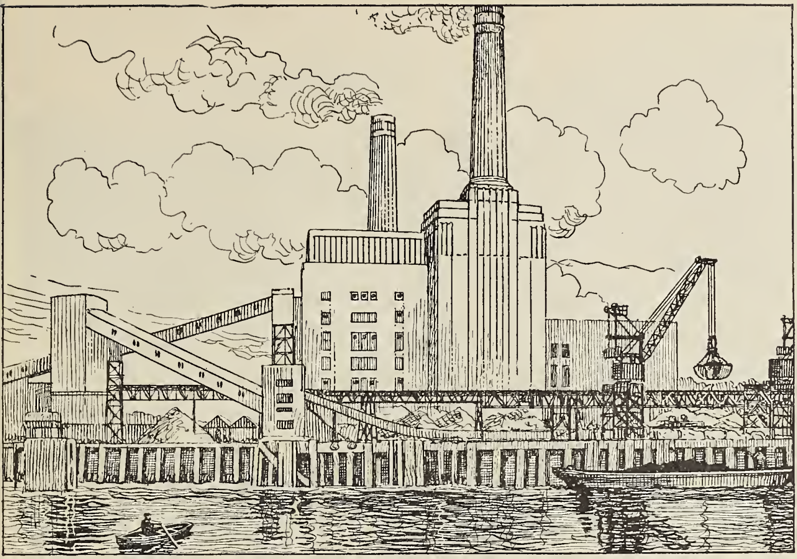
Here and there a few engineers watch them, and control the great switchboard through which the electricity goes out over the wires.

These great dynamos, spinning and humming by themselves in their great halls, make the electricity we use for light and heat and power. But, of course, there must always be an engine to turn them, for they can make electricity only while they turn.

The engines which turn the dynamos may be driven by coal, or oil, or by water-power. And power stations are always built where it is easiest to obtain the ' power ' —coal, oil, or water—which the engines need.

In parts of the world where there are no coalfields power stations are often built in places to which it is easy

Illustration—Dynamos in the hall of a power station.



and cheap to bring coal—usually near sea ports. The biggest power stations in London, for example, are near the Thames, for coal can be brought cheaply to them by water.

In countries where there is a great deal of coal—such as England, America, Germany, or Belgium—most of the power stations are near coalfields, because it is cheaper to carry electricity by wires than it is to carry coal to the power station by train, ship or lorry.

So, too, in countries where oil is used instead of coal, power stations are often built at the places where oil is found, and so is cheap and easy to get.

But in many countries another way of turning the dynamos is used. Water, as it flows along, can be made to turn a wheel ; and there are water-wheels and water-mills in most parts of the world.

The more water there is, and the faster it flows, the better can it turn engines and dynamos. And so,

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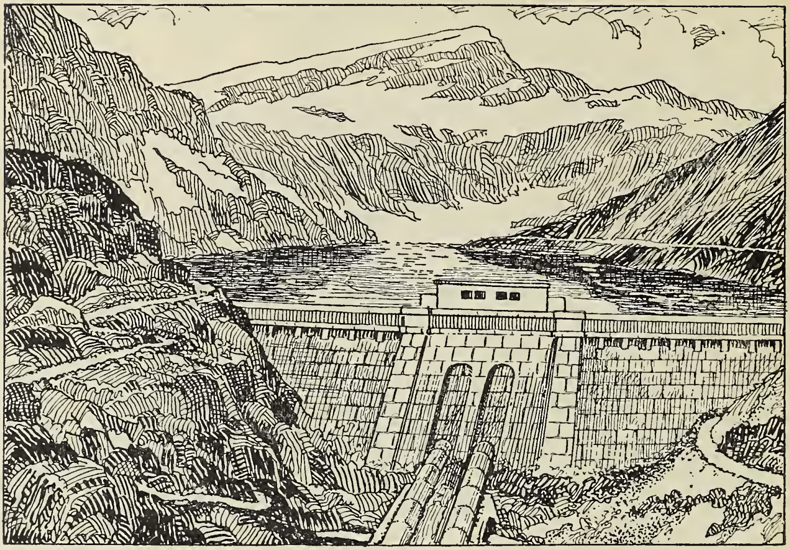
Illustration—Coal arriving at a power station (London).



where there is a steady supply of water flowing in a swift stream, men often use it for making electricity.

A steady, swift stream is found only where there are hills or mountains from which plenty of water must find its way down to the sea.

It is in countries where there are high mountains, with a great deal of snow or rain falling on them, that water-power is used for driving dynamos in power stations.

In Britain water-power is used in some parts of the Highlands of Scotland. In Europe the Alps give water-power for electricity to Switzerland, Italy, France, Germany and Austria.

In America the vast Niagara Falls make electricity for both the United States and Canada. The Rocky Mountains, too, give water-power for America to use.

When water-power is used, the engineers search for a lake high up among the mountains, to provide the steady

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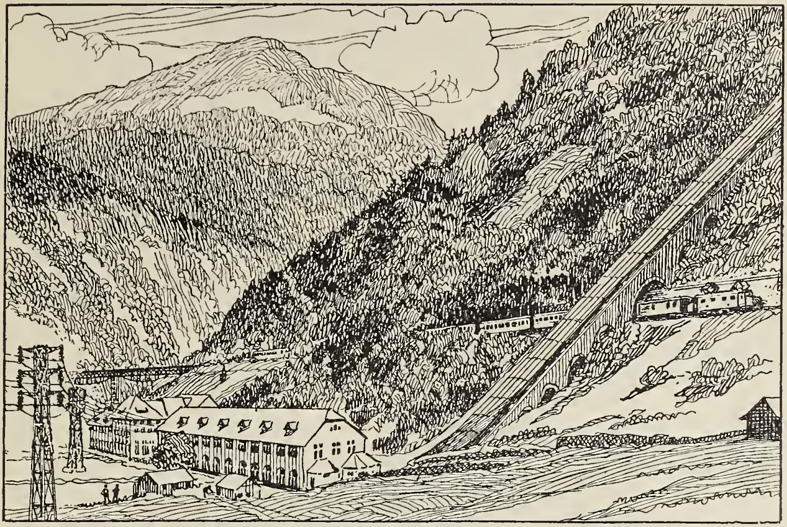
Illustration—The dam and pipe lines.



flow and fall of water that is necessary.

They allow the water to come down from the mountains and form the lake as it did before. But they prevent it from flowing out of the lake by building a great wall, or dam, which they make high and very thick.

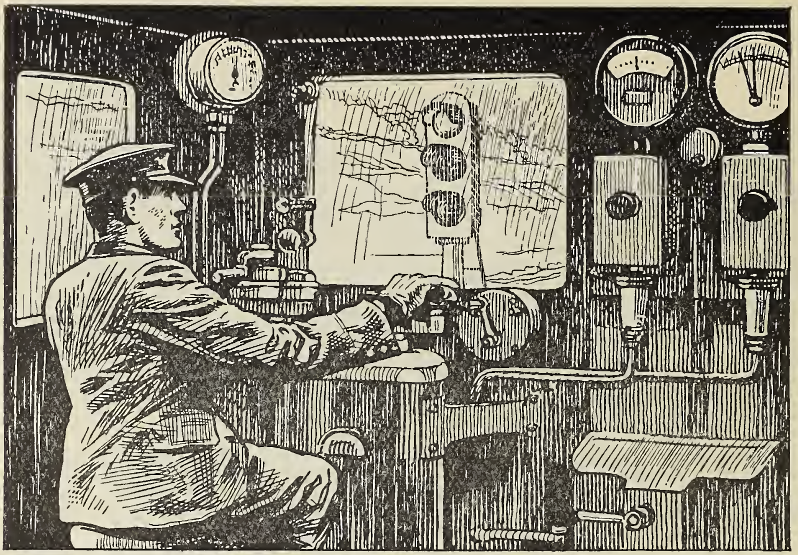
The lake becomes larger and deeper, and the water can run out only through great pipes which lead down from the lake to the power station in the valley far below.

The water rushes down through the pipes and turns wheels with many blades, called turbines, in the power station. The turbines turn the dynamos, and the water, its work done, flows gently away to the rivers and the sea.

No matter how the electricity is made, whether by the use of coal, oil, or water-power, it is led away by wires. The wires branch and branch again, until every street and every house can be supplied with electricity.

And so, very often, the electricity used in houses,

Illustration—Pipe lines and power station.



offices, shops and factories has been made in power stations hundreds and hundreds of miles away.

There is electricity in every country of the world. It is as familiar a thing in Shanghai, Singapore, Melbourne, Cape Town, and New York as in London, Manchester, and Glasgow, for every great city and town has electricity.

There is electricity, too, in very many small, far-off places. It is used in distant islands, in many a tiny village, in quiet farm-houses, and even in towns and villages on the edges of great deserts.

Ships at sea are lit by it, and on land it drives and lights our trains. In many countries men and women work in great factories to make the lamps, the fires, and the machinery that brings electricity and all the many things it can do to our daily lives.

The countries where these things are made are, of course, the countries where many people use electricity, and where the iron and glass and metals that are needed

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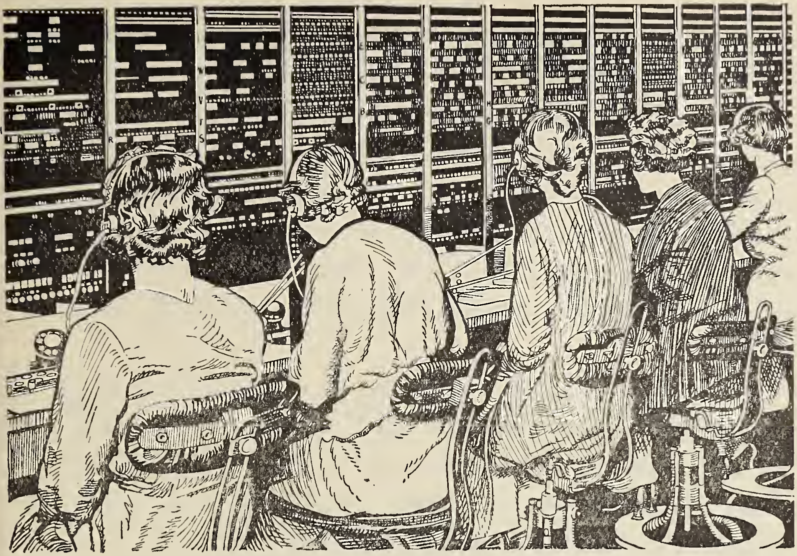
Illustration—The driver's cab of an electric train (England).



for lamps and stoves can easily be obtained.

Two things are very important indeed in all the work of electricity. One, copper, lets electricity pass easily, and is used for the wires which carry electricity. The other, rubber, stops electricity, and is used to keep it in its proper place.

Copper comes from mines in Canada and South America. Rubber comes from trees which grow in Malaya and Brazil.

The great countries of the world for making electrical goods are Britain, America, and Germany.

Electricity does many things. We all know of electric trains and trams. But the telephone, and the telegraph, and broadcasting all depend on electricity. Even our newspapers depend on it, for nearly all the news they tell comes to them by telephone and telegraph.

The telephone is a clever machine which turns the words we speak into electricity. This electricity is led

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Illustration—The International Telephone Exchange (London).

away along wires to the person to whom we are speaking, and his telephone turns it back again into words.

Everywhere there are telephone exchanges to connect one telephone with another. Some of them are automatic, where clever machines link one telephone with another without the help of anyone. In others, men and women are busy night and day connecting the telephones of the people who wish to speak to each other.

We can speak by telephone to almost every part of the world. Over very long distances the telephones are linked, not only by telephone wires, but by wireless as well. London is the chief telephone exchange for nearly every country in the world.

Telegrams are sent everywhere by wires, by cable beneath the sea, or by wireless. Very often they are sent by a clever machine which works like a typewriter. The message is written by the machine at one end, in London, for instance, and another machine prints it at the other end, say, in Manchester.

In many houses, offices, and factories electricity provides light and heat. It drives engines and machines in great factories or small works. It gives us all our telegraphs, telephones, and broadcasting, and so the work of many people is concerned with electricity.

There are not only great power stations with their mighty dynamos to be built, but there are electric engines for pulling trains or working machines, and many other things, large and small, down to electric lamps and bells, and the tiny parts of wireless sets.

All these employ many people in many lands, and much of the work needs great skill and care. Fresh uses for electricity are always being found. The rooms and cupboards where we freeze water to make ice or where we keep food cold, so that it shall not become unfit to eat, are often run by electricity.

EXERCISES

PICTURES

Page 100. Explain why it is important to be able to keep food cold.

Page 102. What is each of these machines doing?

Page 103. Why is this power station close to the water?

Page 104. In this picture point out the work done by the engineers, and explain why it has been done.

Page 105. In what way does this picture tell the same story as the picture on page 103?

Page 106. What is this man's work? Compare it with the work of the driver of a steam engine.

Page 107. Explain what happens at a telephone exchange.

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1. Make a list of the purposes for which we use electricity.
2. Why are power-stations sometimes near a river, and sometimes at the foot of mountains?
3. What happens when we use a telephone? How does the other person know we want to talk to him?
4. Make a list of as many things as you can which are used in connection with electricity. Where does each come from?

25

RAILWAYS

THERE are so many railways, in every part of the world, that it is much easier to know the few places, like Tibet, where there are no railways, than to remember the hundreds of countries where trains run regularly.

Tibet is a far-off land in Asia among the highest mountains in all the world, where people seldom travel far. The other countries near these mountains, too, have hardly any railways, because the mountains are very high and there is little reason for travelling.

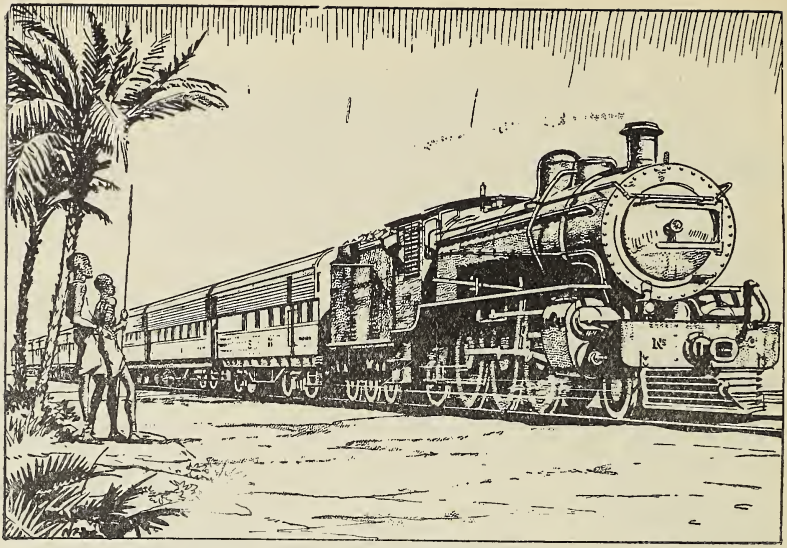
There are no railways in the cold and frozen lands of the far north, the Arctic, and the far south, the Antarctic, for there are no people to travel on them, and no goods to be carried. And in the small islands of the Pacific Ocean there is no need for trains.

But everywhere else, in hot lands and cold lands, in flat lands and even in many lands where mountains rise to the sky, there are railways, stations and trains.

There are many railways in the world, and they are very important, because they are such a good way of carrying people and goods from place to place.

Many of the famous express trains have special names, and one of the best known of all is the ‘ Blue Train ’, which runs from Paris to the sunshine and blue waters of the Mediterranean Sea.

Though there are railways all over the world, the trains are very different in various places. In great and crowded cities, like London and Paris, trains run every minute or so. But the Trans-Siberian Express, which has to run through wild and lonely places on its way from Europe to China, starts only once a week, and takes



nearly a fortnight to make its long journey.

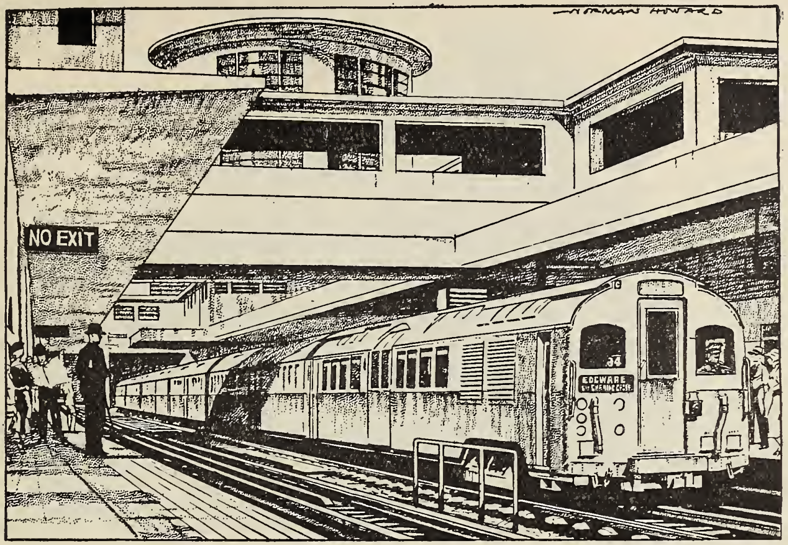
Our own railways travel through a country of green fields, pleasant woods, and busy towns. But the Sudan Express has to cross a great desert of sand and rocks where the sun shines fiercely. It is painted white to keep the carriages cool, and has white shutters for the windows.

Other railways have to run through cold lands, and the carriages must be heated and kept warm. And some trains make such long journeys that people have to eat and sleep on the train, so that there are restaurant cars and sleeping cars.

In countries like Switzerland, where there are many high mountains, there are railways where the trains pull themselves up the steep slopes by cogwheels. When the slopes are steeper still, the trains have to be hauled up and lowered down by ropes.

And where there are mountains the railways often run

Illustration—The Sudan Express.



in tunnels under the lofty peaks. Trains run in tunnels, too, under great cities like London, Paris, and Moscow, where there is no room for them above ground.

All over the world there are great and famous trains, each with its own special name, which run regularly to carry passengers and mails as quickly as possible.

In Britain there are such trains as ‘ The Flying Scotsman ’ and ‘ The Royal Scot ’, running from London to Scotland. There is the ‘ Irish Mail ’, which has run every night for more than a hundred years, and the ‘ Atlantic Mail ’, which meets the great liners from America. The ‘ Cheltenham Flyer ’ is one of the very fastest trains in the world.

Outside Britain there are trains which travel through one country after another. The ‘ Orient Express ’ travels right across Europe from Paris to Stambul in Turkey.

Many of these great trains are like long hotels on wheels, and people live, eat and sleep on them for days

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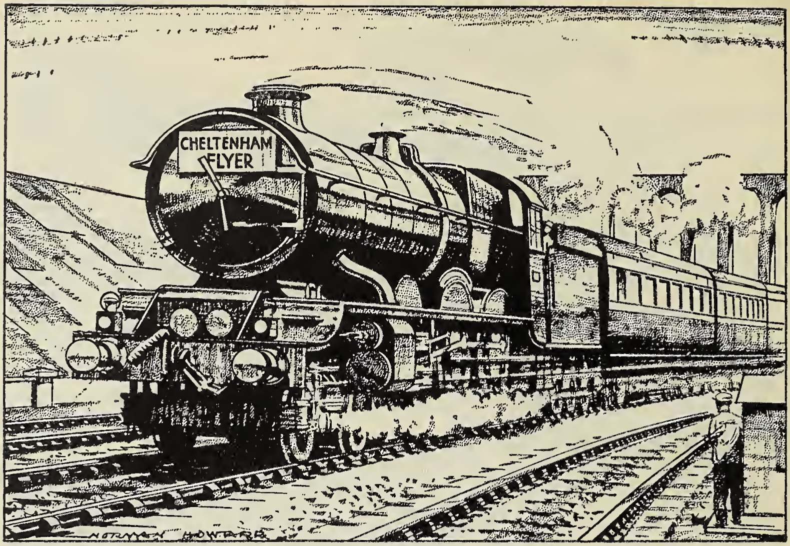
Illustration—A London tube train.



at a time. Cooks, waiters, and servants, as well as the railway men, travel on them.

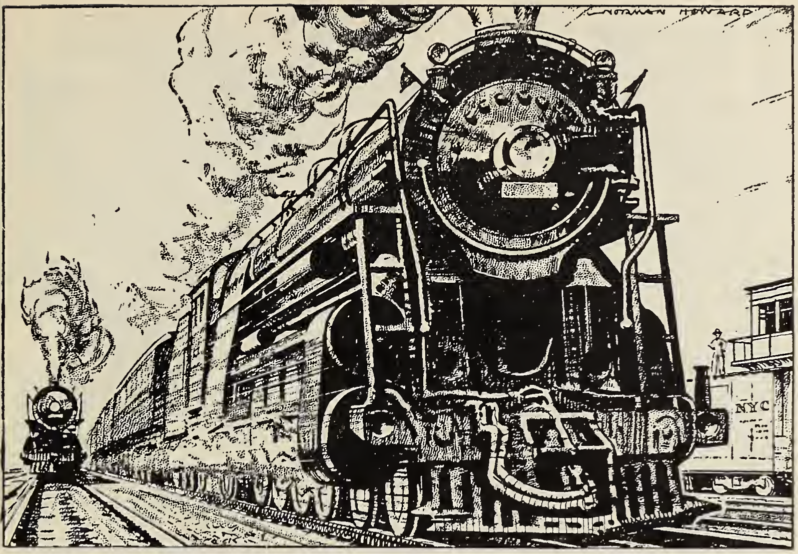
In America trains travel for days to cross the continent from New York to San Francisco, and from Quebec to Vancouver.

One of the most famous of all American trains is called the 'Twentieth Century Limited'. It runs from New York to Chicago, and it takes almost a day and a night—seventeen hours—for the thousand miles of its journey.

American railway engines are bigger than those which are used in Europe. They have a bell instead of a whistle, and a cow-catcher in front. The railway lines in America are not guarded by fences, and the cow-catcher pushes aside any animals which may wander on the line.

American railway engines have great headlights to light the way in front of them, so that the driver can see for himself that there is nothing on the line.

Illustration—The Cheltenham Flyer.



Everywhere, of course, signals must be given, so that the engine-drivers know when the way is clear for them.

The signals that are given to the drivers of trains are very different. In Britain the signals are arms that rise or fall, or lights that turn red, yellow, and green.

In other countries strange signals are used. Sometimes a great square is turned round. Sometimes a circle takes the place of a black square. In Switzerland signals are often given by bells which ring in the stations as the trains pass by.

The most famous trains of the world are the great expresses for carrying passengers and mails. But trains which carry goods and food to and from the factories and the great towns are very, very important.

These goods trains run steadily, day and night, bringing everything that we need in our daily lives.

Many big factories have their sidings, or loading and unloading places for trains. And all great towns have

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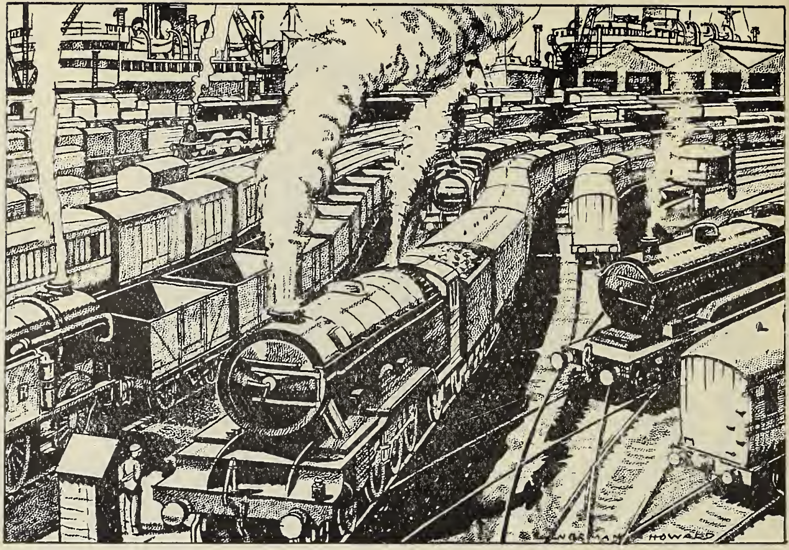
Illustration—The Twentieth Century Limited.



goods yards, where goods and packages of all kinds are received and sent away.

Very many trains are loaded and unloaded at docks, so that ships can take on board their cargoes for far-off lands, or discharge the cargoes they have brought across the seas.

Every dock has its railway line, running close beside the edge of the quay to which the ships come. Goods trucks are taken alongside the ships so that the work of loading and unloading can be done easily and quickly.

On every railway there must be stations, and the stations in different parts of the world are as different as the trains themselves. Some are huge buildings where crowds hurry to and fro ; and some are nothing but wayside stopping places.

In Britain the stations have platforms nearly as high as the floor of the carriages. But in nearly every other country the platforms are very low, and the

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Illustration—A dock-side goods yard.

passengers have to climb steps to reach the carriages. And so the railway coaches are built with steps at each end.

There are countries where people go to the station long before the train is due to come, because the trains do not run often. In Europe and America people may go to the train an hour or so early, but in eastern countries they go to the station a day or two before the train is expected.

Then whole families wait, making a camp near the station and living in it until the train comes. They squat on the ground, cook their food, and talk until the time comes for the journey to begin.

At almost all stations there are booking offices to sell tickets to the travellers, and men who work in the booking offices.

There are ticket inspectors, either on the stations or on the trains themselves, to make sure that every traveller has the right ticket. And there are porters at every

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Illustration—An American goods, or 'freight' train.

station to help passengers with their luggage. And in all big stations, of course, there are many kinds of shops.

There are platelayers, too, to look after the rails themselves, and to see that the line is smooth, even, and safe.

And, most important of all, there are the engine drivers. In some countries, where steam engines are used, the driver has a fireman to help him. The fireman shovels coal on the fire in the engine to keep up the steam that is needed to pull the train. The driver watches to see where the train is going, looks for the signals, and makes it go fast or slow.

In many countries the trains burn coal. But there are places, like Kenya and Finland, where coal is scarce and the railway engines burn wood, and in these countries the trains have to stop often to take on more wood.

But very often the trains are driven by electricity, and the driver sits alone in his cabin with only a few simple handles. The electricity to drive the train comes from wires above the railway lines, or from 'live rails' in the track itself.

Electricity is used to drive trains in places where the railways run through many tunnels, for electric trains are far cleaner than steam trains. It is used, too, in busy places where trains run very often, because electric trains can gather speed very quickly.

And, of course, electricity is used instead of steam in places where it is cheaper to make electricity than to buy coal.

A few trains are driven by engines which burn oil, and some of these trains are very fast indeed.

Railways, though they are very different in different parts of the world, are most important everywhere.

They give work to a great number of men and women in every country of the world. And the work of preparing the coal, oil, or wood which they burn, and making the rails and the engines, the coaches and the stations, all employ many people who are never seen when we take a railway journey.

EXERCISES

PICTURES

Page 110. Say what you can about this picture and the train. Notice some of the things which are different from our railways.

Page 112. What do you know about this train?

Page 113. Why does this train run in a tunnel?

Page 114. Explain the difference between this train and the one on page 113.

Page 115. What differences do you see between this engine and the one on the opposite page?

Page 116. Explain this picture as fully as you can, telling the story of the work which is going on.

Page 117. Why has this engine a ‘ cow-catcher ’? What makes you think it is built to pull very heavy loads?

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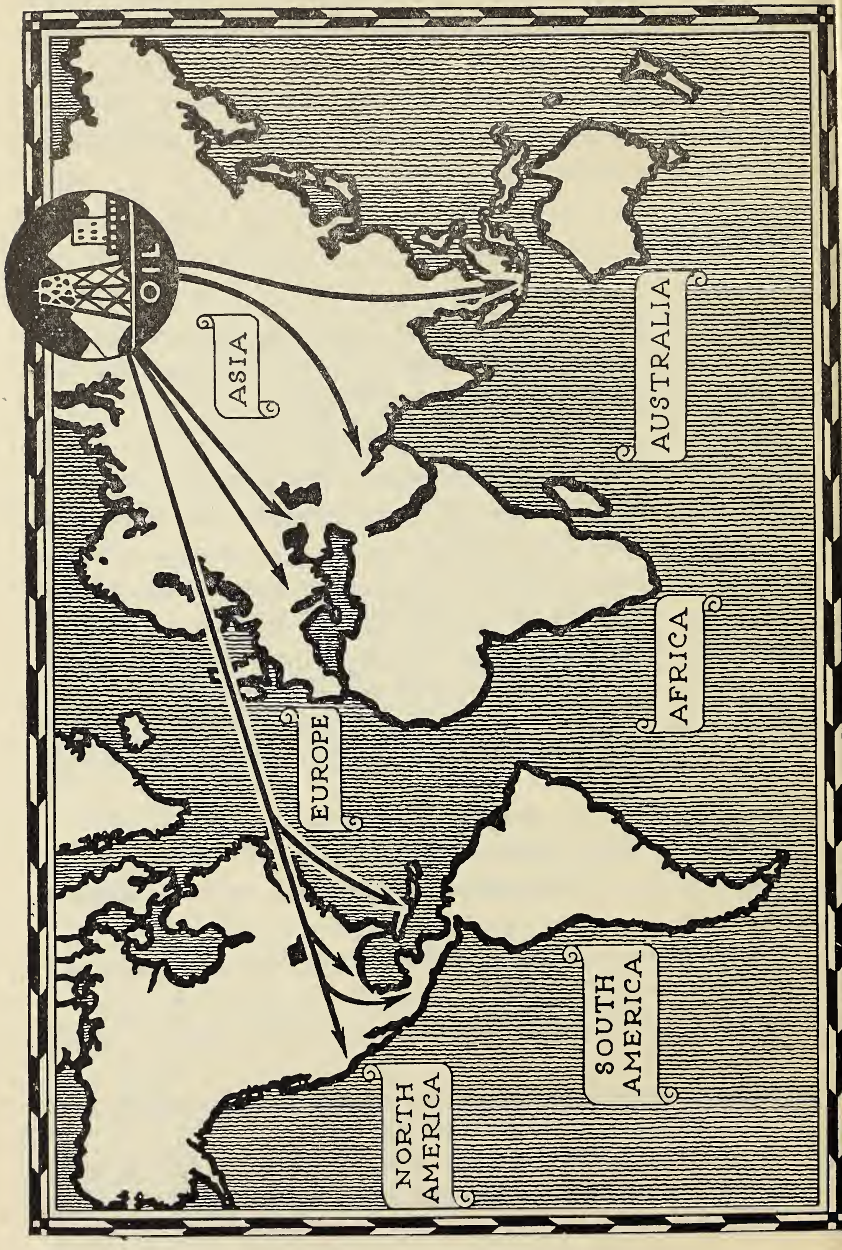
1. Why are railways very important?
2. Make a list of famous trains and find out why each is famous.
3. Which of the trains in your list is nearest to your home and which is farthest away?
4. Make a list of the different kinds of trains and the work they do.
5. Make a drawing of one of the engines in this chapter, and name as many of its parts as you can.
6. Make a model of one kind of railway signal, and another model to show how the rails are laid. (Look at pages 106 and 146.)


OIL
ASIA
AUSTRALIA
AFRICA
EUROPE
NORTH AMERICA
SOUTH AMERICA

OIL

LONG, long ago great parts of the world were covered with dense forests of mighty trees. It was very hot, and the trees grew to a great size.

Then mighty changes came, and the earth's surface became wrinkled into great mountains and valleys. In some places the forests were buried, and there they have remained, far underground, for thousands and thousands of years.

But during the long ages that they have been buried the forests have changed. In some places the trees have turned into coal, and sometimes we can see on a piece of coal the marks of the leaves and stems that were buried long ago. These places are now the great coalfields of the world.

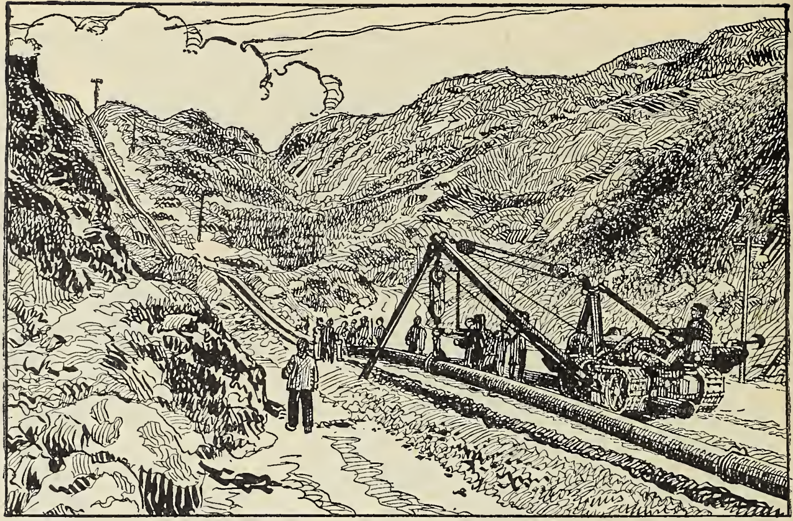
We get many things from coal, and for many years oil has been obtained from the soft kinds of coal which are found in Scotland.

Long, long ago, too, there were buried here and there under the earth's surface some rocks which are even more wonderful than coal.

There is oil in these rocks, and where they lie, deep down in the ground, there are vast stores of oil. These places are called oilfields.

Oilfields are found in every part of the world. The biggest are in the United States of America, Venezuela, Russia, the Dutch East Indies, Iran (Persia), Iraq and Roumania.

Oil can be used very much like coal. The crude oil which comes from the oil wells is 'refined' to make a number of different liquids. One of them, fuel oil,



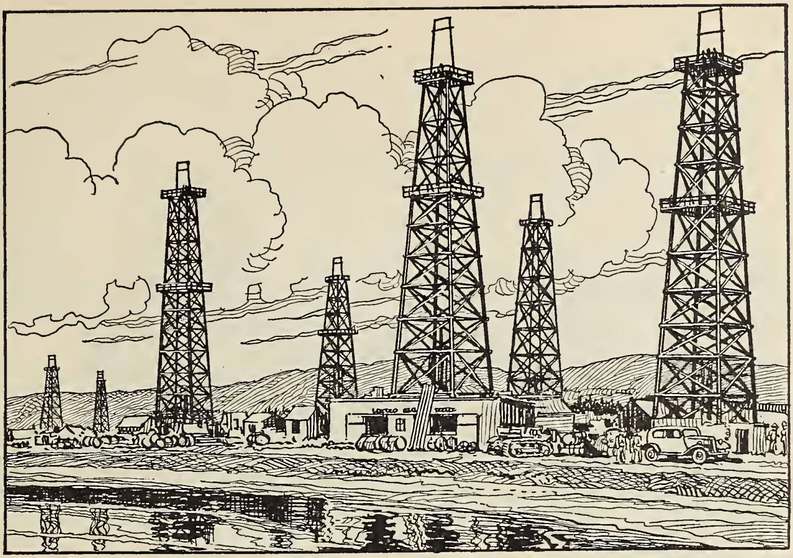
burns just as coal does—and many ships use fuel oil to heat their boilers. Another of the liquids, petrol, can easily be changed into petrol vapour or gas—and the gas which comes from petrol is used in many ways, chiefly for driving the engines of aeroplanes, motor-cars, and buses.

But there is a great difference between coal and oil. Oil does not need mines, with men working underground, to make it ready for use.

If a pipe is driven down into the underground oil-field, the oil can easily be pumped up. Indeed, in some places the oil gushes up in a great fountain as soon as the pipe reaches it.

There is a great deal of gas in these underground stores of oil, and the pressure of the gas often forces the oil up to the surface of the ground in a steady stream. Some of the underground stores contain nothing but gas, and a few towns, like Medicine Hat in America, are

Illustration—Building a pipe line to carry oil.



lighted and heated by this 'natural gas', in much the same way as we in Britain use the gas which we get from coal.

Oil is so important that men go out into many parts of the world to search for it. There is oil under the sandy deserts of Iraq, and under the rich fields of California and Roumania, as well as in the mountainous parts of Mexico and the island of Trinidad in the West Indies.

Just as men know where to look for coal, so do they know the places where oil is likely to be found. But when they have found a likely place they are not always sure of the exact spot at which to bore the hole. They try here and there, driving steel pipes deeper and deeper into the earth, until at last they strike oil.

Then, round the oil wells, there spring up works. There are tanks in which the oil is stored, and sometimes pumps to raise it to the surface. There are engines to

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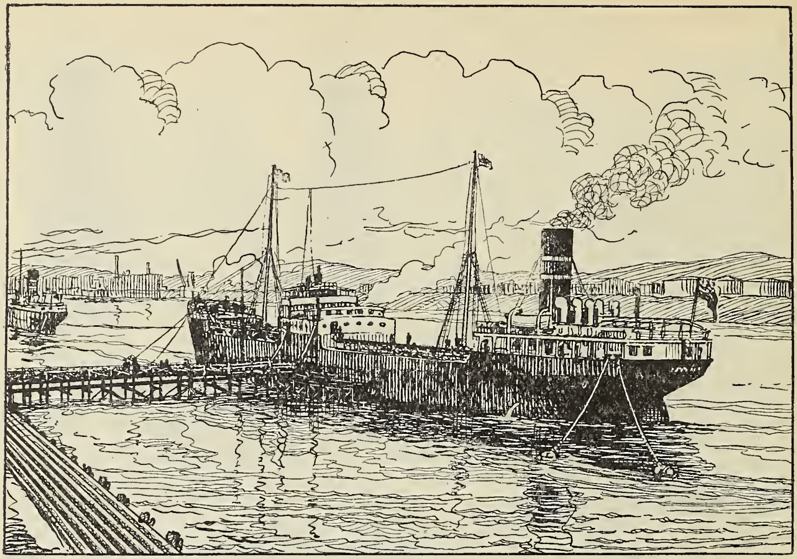
Illustration—Oil wells in an oilfield.



drive the pumps, and these engines burn fuel that comes from the wells themselves.

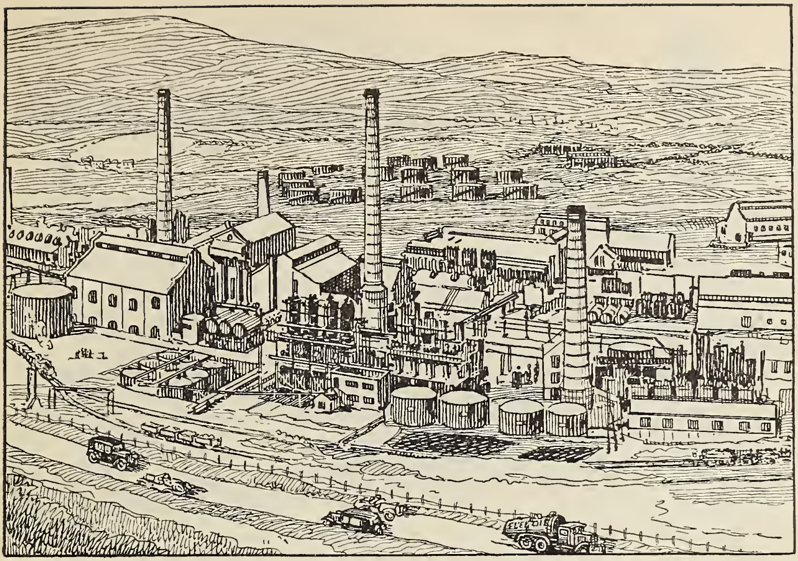
Not very many people work at the oil wells, for nearly everything is done by the machines that the oil drives. But a great deal of work has to be done in carrying the oil away to the places where it is used.

For the first part of its journey the oil is pumped through great pipes to ships and railways. Sometimes the oil fields are close to the sea and the railway, and the journey is short, but in many places the journey is long.

The oil from Iraq is pumped to the Mediterranean Sea through a pipe which is more than a thousand miles long. Here and there along the pipe line are more pumping stations, with engines driven by some of the oil from the pipes.

After its pipe journey the oil has to be carried away to the countries where it is to be used. In one way or another oil is used in every country of the world.

Illustration—The end of the pipe line—loading an oil tanker.



Some of the oil is stored in great tanks. Some of it is loaded in railway wagons specially built to carry oil, and if the journey is to be across the sea it is pumped into special ships, called 'oil-tankers.'

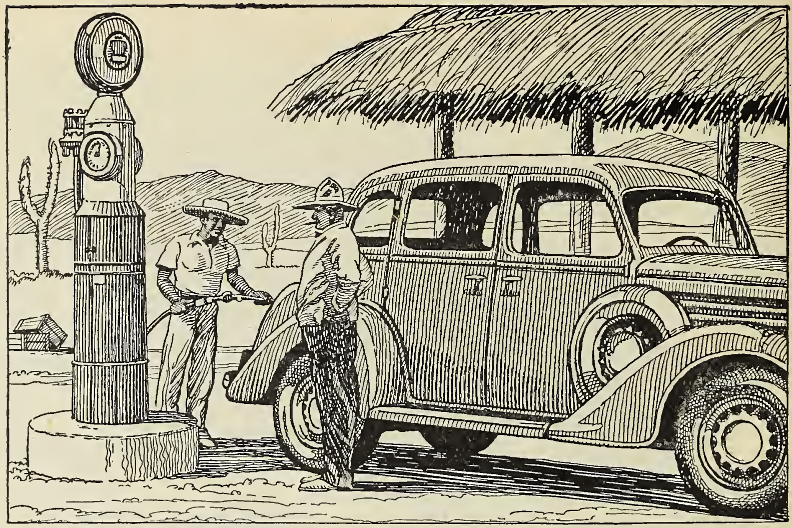
The oil as it comes from the oil wells is called crude oil, and is taken away, usually in oil-tankers, to refineries in many parts of the world.

In the refineries crude oil is separated into many different things. Besides petrol and fuel oil, crude oil gives us paraffin, for burning in lamps and stoves ; oil for lubricating motor-cars, engines, aeroplanes, and almost every other machine that needs oiling ; wax, pitch, and many other things as well.

Grease is made in the refineries, too. There are many kinds of grease : thick and heavy grease for machines, vaseline, and creams and ointments. All of them are made from the crude oil, or petroleum.

In the refinery, petroleum is heated and distilled to

Illustration—An oil refinery.



make petrol, and great care is taken to make sure that the petrol is clean and pure. Very often such things as ' ethyl ' and benzol are added to make the petrol better for use in motor-cars and aeroplanes.

When the petrol is ready it has to be stored in great tanks ready to be taken away. An oil refinery has great tanks all round it, some full of crude oil, and some with petrol in them.

Great care has to be taken, because many kinds of oil burn fiercely, and of course, petrol catches fire very easily indeed. The tanks are put a long way away from each other and nothing alight is allowed near them.

Then the petrol has to be taken from the refinery to the filling stations, tanks, and pumps, which supply it to motor-cars, buses, and aeroplanes.

We can often see huge tanks running along the road to fill up petrol pumps, and we can see, too, special tank wagons in the goods yards of the railways. Petrol

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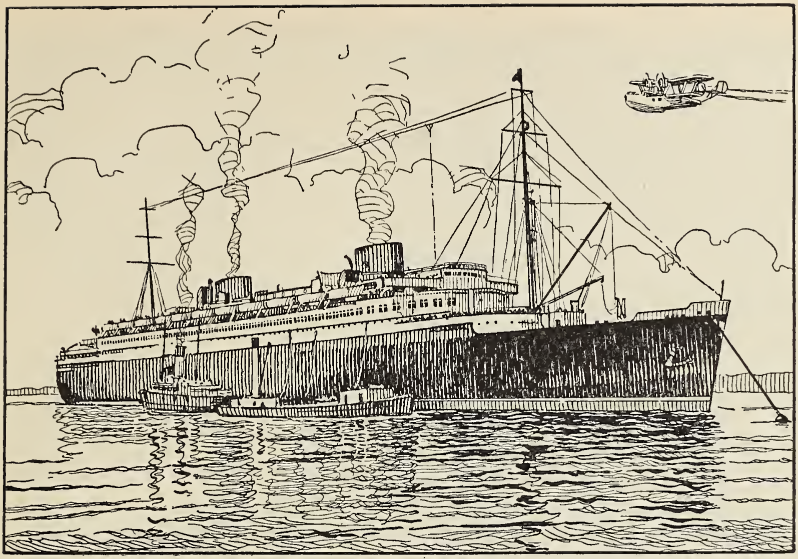
Illustration—Filling the tank of a motor-car (South America).



and oil are, every day, being taken to the places where they are wanted:

In nearly every part of the world we can see great liners taking on oil through huge pipes. Sometimes the oil is brought to them in barges, and sometimes it is pumped on board from the quay.

We almost always think of petrol pumps beside a busy road. But there are petrol stations on lonely roads, far from any town. There are great stores of petrol here and there even in the Sahara Desert, for the cars and buses which sometimes cross that great space. There must be petrol, too, at every airport.

Many people have to work at carrying petrol from the refineries to the places where it is needed. Sometimes it is carried by road, and sometimes by rail and sea.

Often, in far-off parts of the world, it is carried in huge barrels, called drums, which are loaded on carts, or carried on the backs of animals.

Illustration—Pumping oil on board a big ship.

The other things made from petroleum, too, have to be taken from place to place. Oil and grease are also needed almost everywhere.

Oil is one of the most important things in the world to-day. There is much work to be done in buying, selling, and carrying it ; and in making the pipes, building the refineries and the ships that are needed.

EXERCISES

PICTURES

Page 122. Explain what these men are doing.

Page 123. What is the work done here ?

Page 124. How is the oil brought to this ship ? How will it be unloaded ?

Page 125. Compare this picture with the one on page 123. Name some of the things which are made here.

Page 126. In what ways is the work of a petrol station like that of a coaling station ? In what ways is it unlike ?

Page 127. Say what you can about what has happened to the oil on its journey from the oil well to this ship.

Page 129. Why is this ship called an oil-tanker ?

MAP

Page 120.

1. To what places do the arrows point in the map ? Make a list of them.
2. Compare this map with the maps on pages 70 and 80. What do you notice ?
3. Name large parts of the world which do not produce oil or iron.

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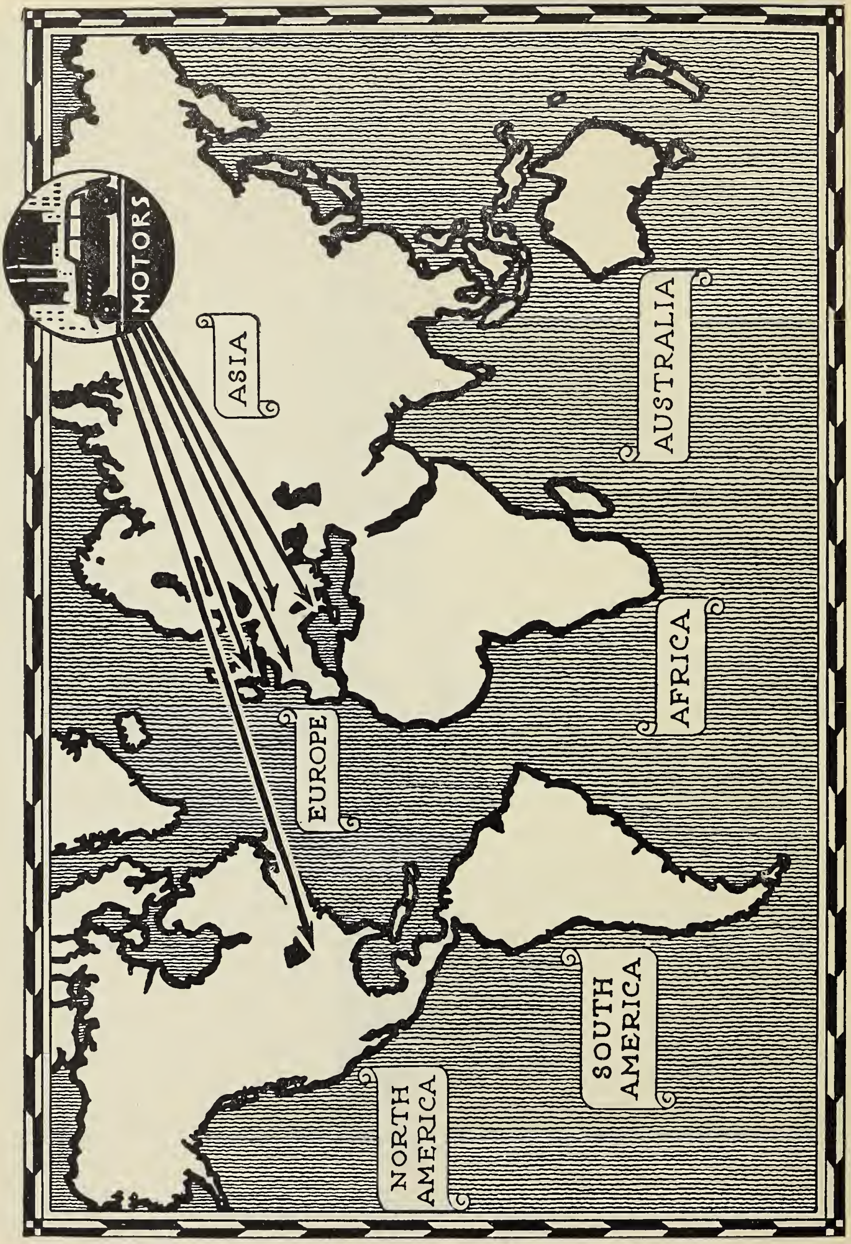
1. In what ways is oil like coal, and in what ways is it unlike coal ?
2. Compare the ways of getting coal with those of getting oil.
3. Make a list of the uses of oil. Why is it often called mineral oil ?
4. Examine a petrol lighter. How does it work ?
5. Examine a paraffin lamp. How does it work ?


MOTORS
ASIA
AUSTRALIA
AFRICA
EUROPE
SOUTH AMERICA
NORTH AMERICA

MOTOR CARS AND ENGINES

EVERY country in the world has its roads. Along some of them Chinese coolies trot, carrying loads slung on long poles over their shoulders.

There are roads over which camels and donkeys carry their burdens, and there are others where horses and oxen draw heavy loads. In many far-off lands the roads are nothing more than rough tracks winding over deserts, through swamps and dense forests, or climbing up rocky hillsides.

But to-day, over almost every possible road in the world, there run motor cars and motor buses. The Arabs of Northern Africa and Arabia love to travel by motor bus. So do the people of China, and the natives of India.

Cars and lorries make their way over farm roads and forest tracks in every part of the world. They carry food, and many of the goods that are sold in our shops, from place to place, and take them to the ports and the ships which carry them across the seas.

These cars and buses and lorries, no matter where they are used, have all been built in the great car factories of the world. And these great car factories are in America, England, France, Germany, and Italy.

The countries which build cars are those with coal mines and ironworks. Motor-cars need good steel —steel that is light in weight as well as strong. They need aluminium, which is far lighter than steel. And

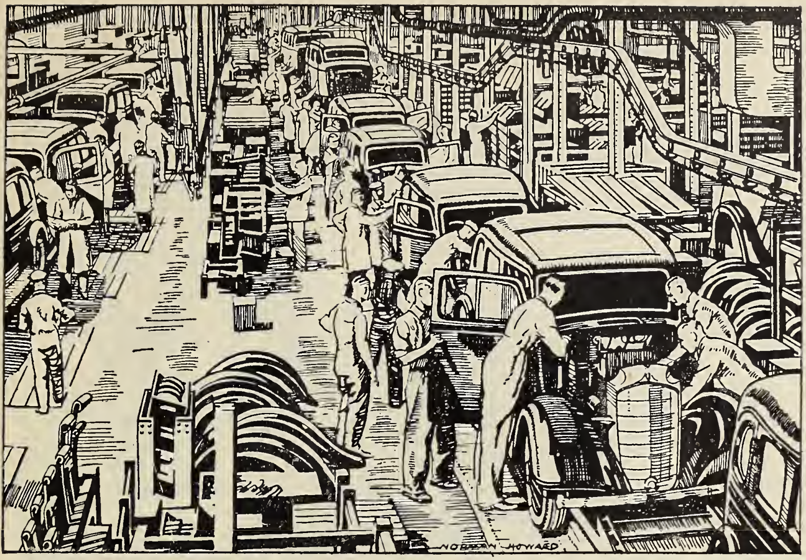
chemists are always trying to make metals that are lighter, and stronger, and harder still.

The heart of a motor-car is its engine, which must be well and carefully made. Engineers are always working to design better and more reliable engines. Every car factory has men who drive and test newly-designed engines and cars to make sure that they are as good as possible.

Engines of all kinds and sizes are made—big engines for buses and lorries, and smaller engines for cars. In some countries, such as France and Germany and America, petrol or oil engines, like large bus engines, are used for driving trains.

But the engine is only one part of a motor-car. There is the framework—or chassis—on which the whole car is built up. There are the wheels, with their tyres made of rubber from Malaya or Brazil, strengthened with cotton threads from America or Egypt.

Illustration—Building motor-car engines.



Illustration—Fitting the body to the chassis.

The electrical fittings—the self-starter, the dynamo, the battery, the lights, and the horn—have to be made. So do the brakes and the instruments for the dashboard. The body has to be built, with its seats and carpets, doors, windows and roof.

All these many different parts have to be made before the whole car can be put together or 'assembled', ready for use.

The car is put together as it travels slowly along a long line, past the workmen who fix the different parts in their proper places.

At the start it is nothing but a simple framework of steel. Then, one after another, the wheels and axles, the engine, the brakes, and all the many other parts are added and bolted together.

At the end of the long travelling line the framework which began the journey has been changed into a complete car. Last of all, the body is lowered on to the

chassis and fixed to it, the oil and water tanks filled, and the newly-finished car driven away.

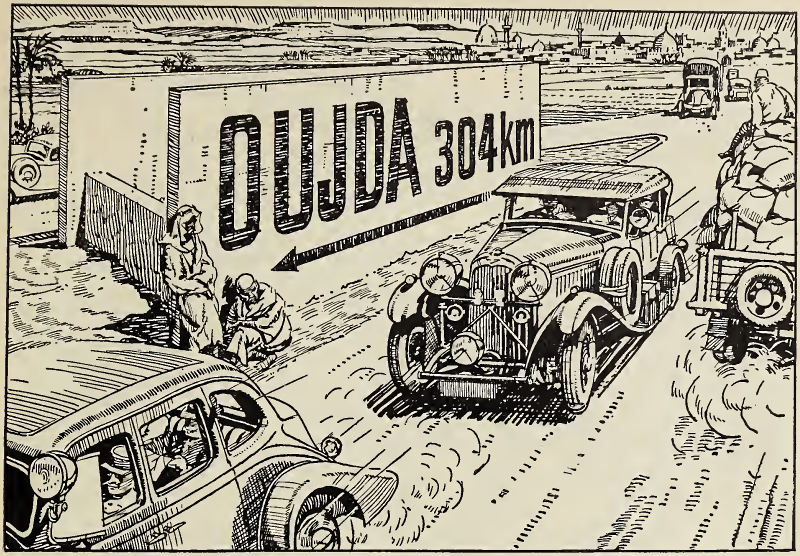
In the great car-producing countries many people work at making cars and all the things—steel, tyres, paint, glass, and cushions—that are needed for cars and buses and lorries.

And, in every country of the world, a great number of people use motor cars and lorries and buses in their daily work. Some folk use them only for travelling to work or for pleasure, while others drive them for a living.

There are the drivers and conductors of buses. There are people who drive the cars that deliver goods from factories and docks to the shops, and from shops to people's houses.

There are little shops on wheels, which drive about in places far from the railways and the big towns, and there are huge lorries which take great loads of goods to market.

Illustration—The bus across the desert from Bagdad to Damascus.



So it is in every country of the world. There are cars and lorries carrying goods of every kind over the Alps and mountains of Europe, across the deserts of Africa, Asia, and China, and over the rolling prairies of Canada.

Cars wind their way up the steep and stony hills of India and Ceylon, among the tea plantations.

They travel over deserts, where they need all their speed to escape from robbers. They carry the mails with their precious messages.

The petrol and oil which they need come from the world's great oilfields, in America, in Venezuela, in Iraq, in Russia and Roumania.

Petrol pumps and signposts are to be seen beside all the roads of the world. There is a signpost in the north of India which reads, ' To London, 5,970 miles.' There are huge milestones, higher than a man and as wide as a house, in Africa. And there are bridges and ferries,

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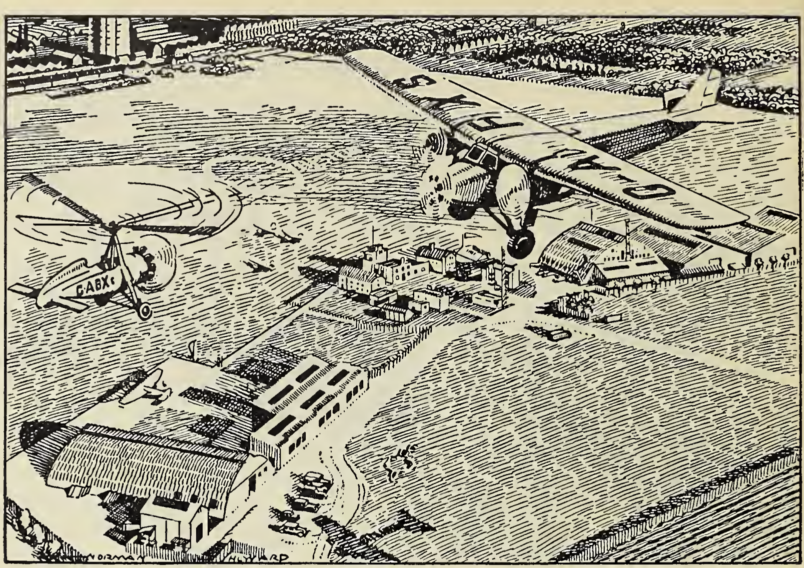
Illustration—A giant signpost (near Fez, Morocco).



to carry cars over rivers and lakes, in every part of the world.

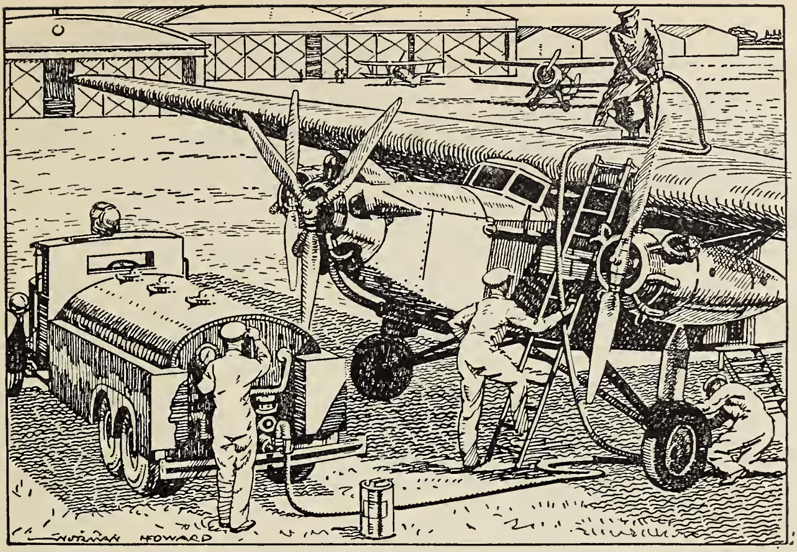
Petrol engines, much like those which are used in motor cars, are also made for aeroplanes.

Aeroplanes are made chiefly in the countries where their engines can be made well, for an engine is even more important in the air than it is on the ground. An aeroplane must come down to the ground as soon as its engines cannot keep it flying.

Aeroplanes are made in England, America, France, Germany and Italy ; but they fly in every part of the world. They are the quickest way of travelling and of carrying mails, and they have many other uses.

In the great forests of Canada, from which so much timber comes, fires often begin in dry weather, and burn thousands and thousands of trees. Aeroplanes fly over the forests to watch for the beginnings of these fires, and then fight the fires in many clever ways.

Illustration—An airport (England).



In other countries there are plagues of insects, called locusts, which come in a dense cloud and eat all the crops. Aeroplanes meet the locusts and destroy them before they can ruin the food.

Aeroplanes, too, often search for lost travellers in the lonely parts of the world—among high mountains or in waterless deserts.

There are huge aeroplanes on which people can eat and sleep as they travel, and big flying boats to cross seas and oceans.

Aeroplanes must have aerodromes where they can land, load, and unload, and take on more petrol.

Men have work to do, not only in flying aeroplanes, but on aerodromes, for the same reason that a great deal of work has to be done at railway stations. And an aeroplane's engines have to be looked after very, very carefully

Many men and women owe their work to motor-cars

Illustration—Refuelling an air liner (Imperial Airways).

and aeroplanes. There are the people who make and build them, the people who drive and fly them, the people who receive the goods and news that they bring —the people whose work and living depends on what petrol engines can do.

EXERCISES

PICTURES

Page 132. Why is this work important ?
Page 133. Explain how the cars are being built.
Page 134. Say what interests you in this picture and why.
Page 135. What do you notice about the sign-post, the town and the cars ?
Page 136. Tell all you can about the things shown in this picture.
Page 137. How does (*a*) a steam engine, (*b*) an electric engine, get its fuel ?
Page 139. Tell what these men are doing, and why their work needs great care and skill.

MAP

Page 130.

1. Make a list of the chief countries which build motor-cars and aeroplanes.
2. Compare this map with the map on page 120. Are the motor-cars built where oil is found ? (Look at the map on page 80.)
3. Why do British people wish to produce oil from coal ?

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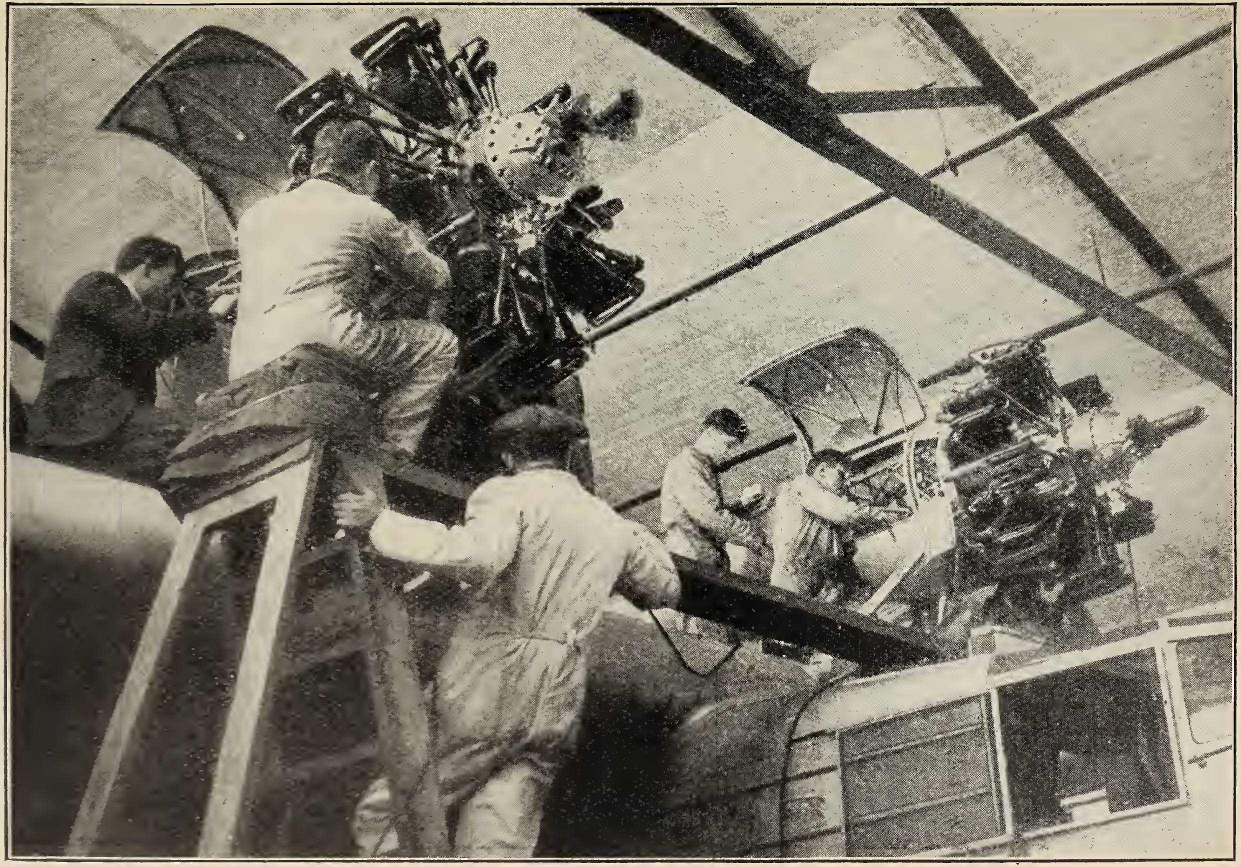
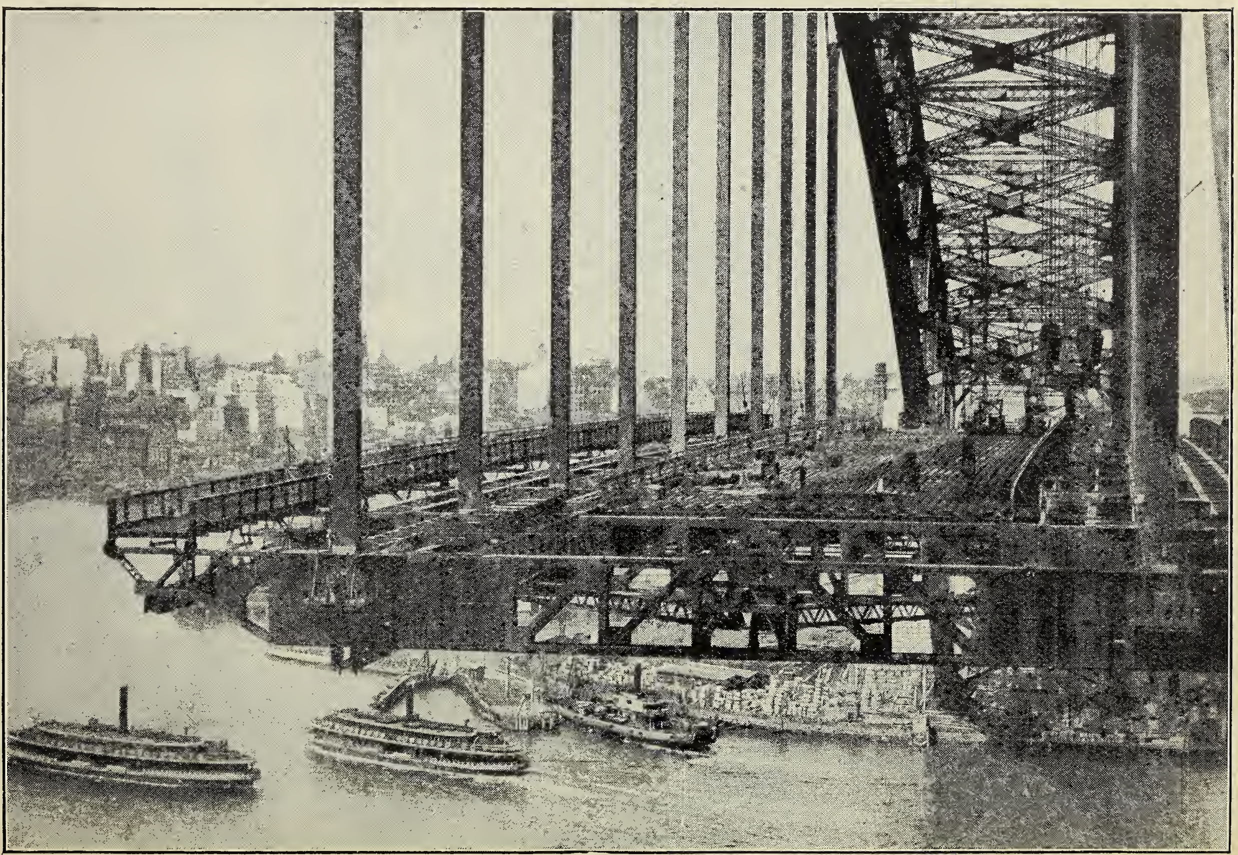
1. Tell what you can about the different engines and what they are used for.
2. Tell the story of the making of a motor-car.
3. In what ways is an aeroplane like a motor-car ? In what ways is it unlike ?
4. What is the work of an airport ? In what ways is it like and unlike a railway station ?
5. Make a drawing of a motor-car and name as many parts of it as you can.





THE MAKING OF ROADS

FOR a great deal of the work that is done in the world things must be carried from place to place. Food must be brought from the farms where it is grown, and from the factories where it is made and cooked and packed, to our shops and houses.

Coal has to be carried from the mines to the places where it is burned. Iron and steel must be brought from the works where they are made and forged.

Cotton and wool have to be taken to the mills, and the woven cloth carried away to be made into clothes.

There are some things which grow better in certain parts of the world than elsewhere. Wheat grows very well in Canada. There are great herds of cattle in America and the Argentine, and vast flocks of sheep in Australia and New Zealand.

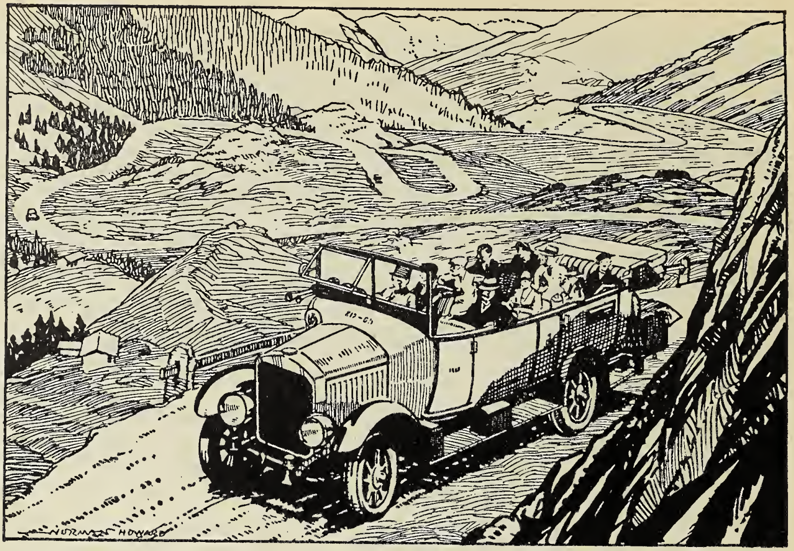
Tea grows in India, China, and Ceylon. Coffee grows in Arabia, Kenya, and Brazil. Cocoa grows in West Africa, and sugar in the West Indies.

Cotton comes from America and Egypt. Wool is shorn from the sheep of Australia and New Zealand. Rubber is tapped from the trees of Malaya and Brazil.

Coal is found chiefly in Britain, Germany, Poland, Belgium, France, and America. Iron-ore is often found near the world's great coalfields. There are oil wells in Russia, Roumania, Iraq, Venezuela, and America.

The countries which need most of the world's food, and which use most of its raw materials in their factories, are the great industrial countries.

Many people live in these great industrial countries,



which are England, America, Germany, France, Italy, and Japan.

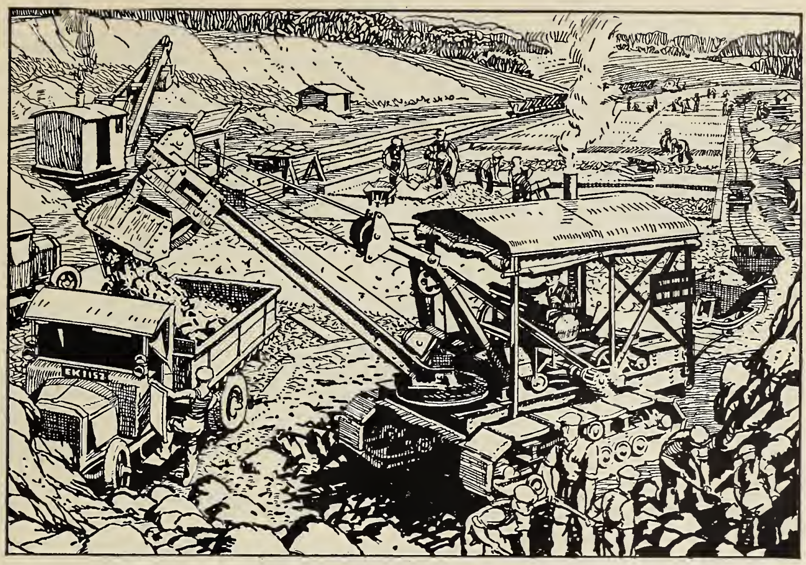
There are other countries, with even more people living in them, which have hardly any factories. China, India, and Africa have huge numbers of people living in them, but they have only a few factories.

So there is always a great coming and going over the face of the world. Food has to be carried to busy, crowded lands from the places where it grows best.

Raw materials must be brought to the factories, and the goods into which the raw materials are made must be taken away to shops in many lands, so that people may buy and use them.

Not only goods, but messages as well, have to be carried from place to place. And many men and women have to travel from place to place on the world's business. It is very, very important, therefore, to be able to travel quickly and easily.

Illustration—A mountain road (Switzerland).



The making of roads is a great and important part of the work of the world, for there are very many kinds of roads.

It is far better to travel along a smooth road than over a muddy lane, but even a lane is better than a rough, uneven track.

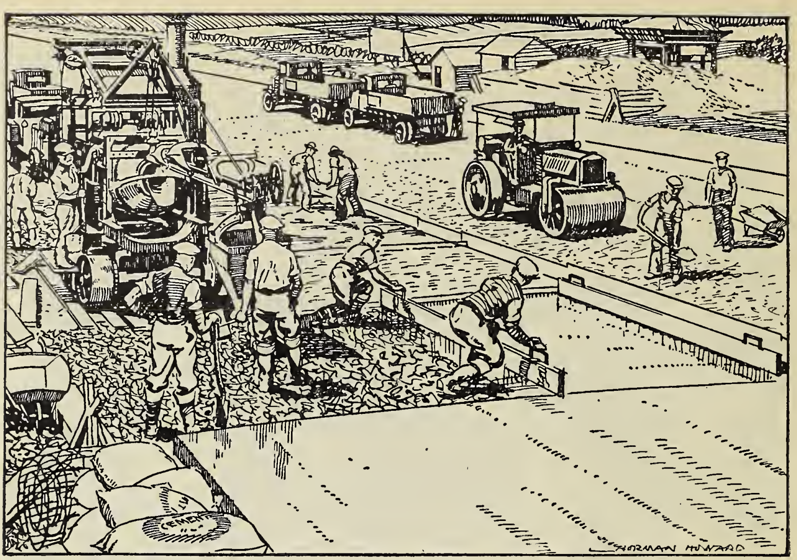
From the very earliest times men have constantly been making better and better roads. The Romans built fine roads, and made them straight, level, and smooth.

To-day we make roads which are far stronger and smoother than even the Roman roads.

The first thing in building a road is to make sure that it goes from place to place by the best way. The best way is, of course, the shortest, but the shortest way cannot always be chosen.

There may be hills and rivers to be crossed. The road-builders have to find out which direction will

Illustration—Digging and levelling a new road.



have the gentlest slopes, and cross the rivers at the best places.

Then workmen begin to dig out the road and level it. They make cuttings through hilly places and build up little hollows, and try to make the road as level as they can.

When the track of the road has been dug and levelled, great loads of stones are spread over it, so that the finished road shall be strong enough to carry heavy loads.

Over this rough and rocky bottom layer the road surface is laid. The surface must be smooth, so that people can travel easily along it. Water, too, must drain quickly and easily away from it, so that the road is not washed away by rains, or covered by water.

Sometimes the surface is made of small stones rolled in until they are firm and even. This is called a macadamised road, and it is often covered with tar and

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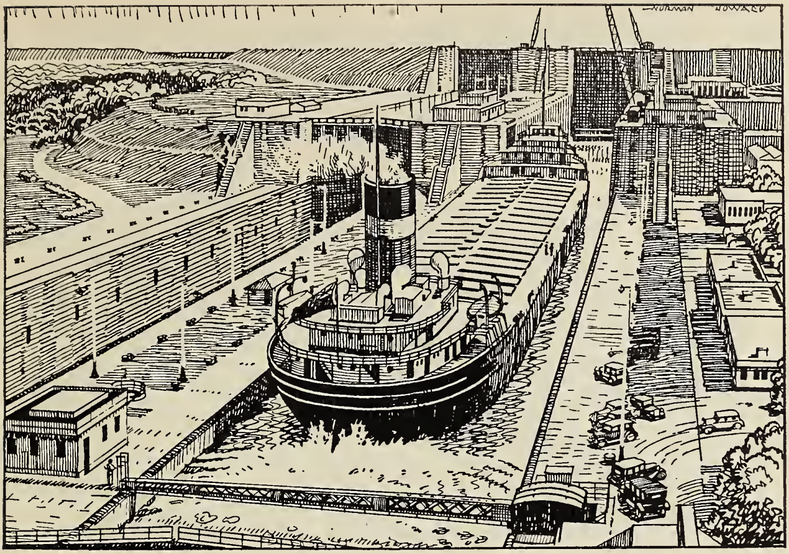
Illustration—Finishing and rolling the road.



small stone chips, or gravel or grit.

Sometimes the surface is made by rolling in small stones that have been covered with tar. This is called a tarmac road.

Some roads are made of concrete. The wet concrete is spread over wire netting and then left to dry into a smooth, hard, waterproof surface.

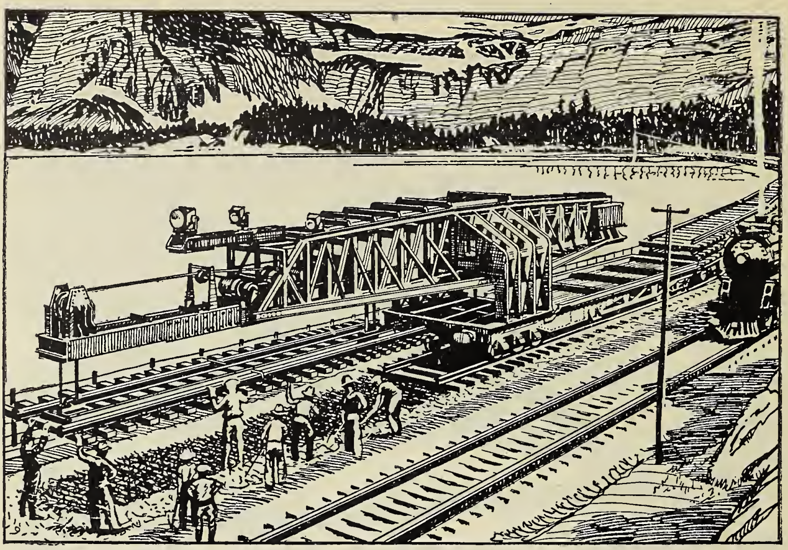
Many roads are covered with the shiny black, hard surface of asphalt. Some are paved with wood blocks, and some with stone.

The making of roads means that bridges must be built, for rivers, canals, and railways must be crossed.

It means, too, the laying of water pipes, gas pipes, electricity cables, telephone wires and sewers, for in towns most of these things are buried under the roads and streets.

But no matter how well built and strong a road may be, some loads are better carried in other ways, and

Illustration—A lock on a great ship canal (America).



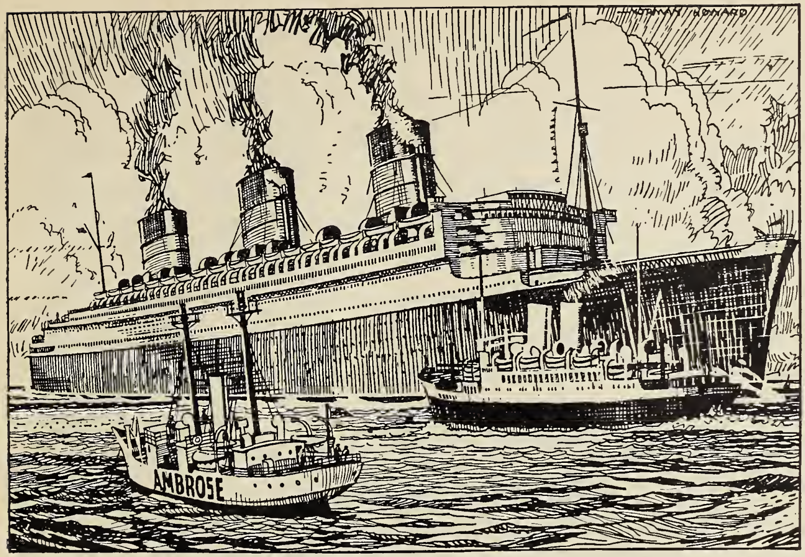
so there is work to be done on canals and railways.

A canal is very much like a deep road bed filled with water. It must be quite level, to hold the water, and it must be dug out to a great depth. Locks must be built to let the ships and barges go up hill and down.

It is interesting to remember that we speak of 'navvies', because, over a hundred years ago, when many canals were being built, the workmen were called 'navigators'.

A canal does not flow down hill like a river. It goes down in steps, as if it were stepping down stairs. When the boat comes to the top step, the water on which the boat is floating is shut off in a lock, and made to sink to the level of the next step. The boat sinks, and then goes on its journey till it comes to the next step. The water is again shut off and made to fall, and then the boat goes on.

Illustration—Building a railway (America).



Boats are lifted up the hill by raising them up the staircase of locks. But to raise them up water has to be let into the lock from above until the boat is level with the upper step.

Canals are roads of water along which ships, tugs and barges travel. They are the waterways which men have made, and they always join the great water ways of nature—the rivers, lakes and seas.

Railways are yet another kind of road. Instead of stones, tar, concrete, or asphalt, they have a surface of steel rails firmly fixed to sleepers, which are bedded in the ‘ ballast ’ of stones.

Railways must be very firm and smooth, and they must be very level, too, for trains cannot climb steep hills.

The building of railways—or roads of steel—means the making of cuttings and embankments, the driving of long tunnels through the solid earth, and the building of bridges and viaducts.

Illustration—A signpost of the sea—the Ambrose Light, New York.

But roads, canals, and railways are only the ways in which we travel over the land. There are also the roads of the sea, and the roads of the air.

Ships, on their journeys across the ocean to far-off lands, follow well-known and well-marked courses—the roads of the sea—with lighthouses, lightships, and buoys as their signposts.

They have to avoid dangerous rocks and sands, and, like the roads on land, they have to follow, as far as they can, the shortest and the easiest ways.

There are lighthouses on lonely cliffs, lightships anchored near dangerous reefs and sands, and buoys with bells and lights to warn the sailor.

All these are the lamp posts and signposts of the roads of the sea, and there are special maps, called charts, which show them.

Many years ago men went out bravely over unknown seas to find new lands and new ways. Many of them were lost and perished.

But soon after came the men who made and marked the roads to the places they found—the roads of the sea.

To-day we are finding and marking the roads of the air. Men and women set out to make a new journey by aeroplane, and win or fail after a mighty struggle.

Then come the road makers. They build the guiding marks, and clear aerodromes, so that the carrying of passengers, mails and goods shall be even swifter and safer than before.

There are, too, the makers of those roads by which our messages travel so very quickly to every part of the world—the men who lay the wires and cables for our telephones and telegraphs, and the builders of the great wireless stations.

In the building of every road the story is always the same. First comes the pioneer, the explorer, or the inventor, who finds that the road can be built.

Then come the road makers, who make the way easy, quick, and safe for men and women. And last of all comes the traffic of people, goods and messages—the life-blood of the world.

EXERCISES

PICTURES

Page 140.	Explain the different ways by which a road may cross a river.
Page 142.	Why does this road wind about? Are the roads near your home winding or straight?
Page 143.	What do you notice about the machine with the "grab" which is loading the lorry?
Page 144.	Explain this part of the making of a road.
Page 145.	Why may a canal be called a road? What happens to a ship at a lock?
Page 146.	How is a railroad built? Why are there tunnels and bridges?
Page 147.	Why do we speak of "the highways of the sea"?

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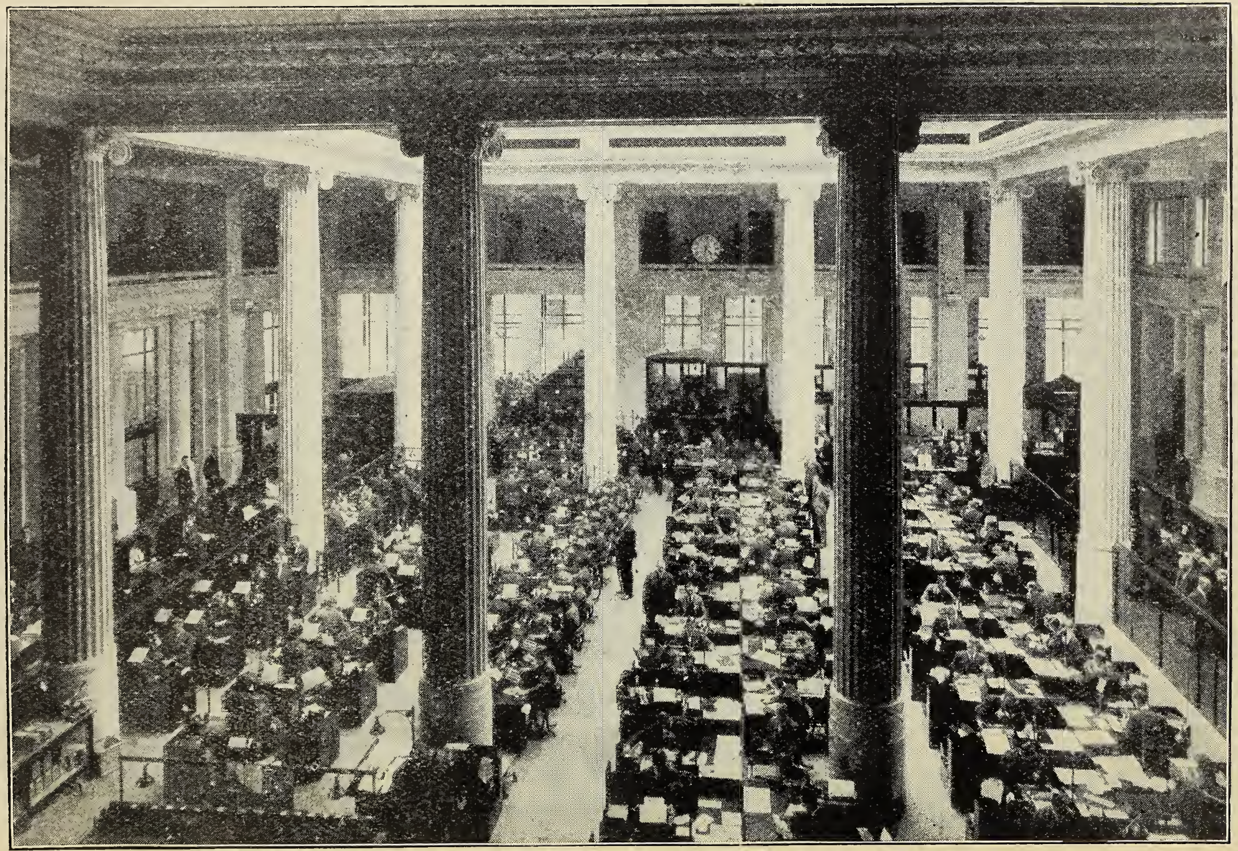
1. Why are roads very important?
2. How many kinds of roads can you think of? Which of them have to be built by men, and which are already there?
3. Say what you can about the roads of the sea, and the highways of the air. How do men find them?
4. Make a model to show the surface of a road you know and the layers below the surface.
5. Make a model of a canal to show how a lock works.



WORKING TOGETHER

EVERY country of the world has its own special kinds of work to do, and all the men and women who work in each country have their own special tasks.

But all these many kinds of work, and all these special tasks, are very closely linked with the work that many other people, in other countries, have to do.

The story of rubber shows very clearly how important it is for people to work together in many different parts of the world.

Rubber is grown in far-off Malaya, where dark-skinned people grow the trees and tap them to get the liquid rubber. More people make the rubber solid by curing it, so that it is ready to send across the seas to other lands.

There is a great deal of carrying, by train and ship and road, to be done before the rubber reaches a factory in England or America or Germany.

Once it is in the factory many more people have work to do. Some of them clean the rubber and make it ready for the next processes. Some of them make it into motor-tyres, and use also cotton that has come from America, Egypt or India.

Other people use it to make macintosh coats by treating cloth with it. There are people who work at making tennis balls, and people who make it into fountain pens.

In electrical factories, too, rubber is greatly used. It is wrapped round wires, and used in making switches and wireless valves.

All these people are working together, to make the best use of rubber. And a very great part of all the

Illustration—Carrying goods on camels' backs.

world's work comes from the fact that men, in many different countries, must work together.

But if men are to work together a great deal of work must be done in carrying goods from one place to another. Sometimes they have to be carried from the places where they grow to the factories, and sometimes from the factories to the shops where they are sold.

In some parts of the world goods have to be carried on the backs of animals. Among the Himalayas, for example, tea has often to be carried over steep and dangerous tracks on the backs of mules. Sometimes the yak is used, and the yak not only carries loads, but supplies milk, food, and clothing to the people of these high mountainous lands.

Carpets from Persia are carried on the backs of camels for a part of their journey. And in many parts of the world goods are taken to and from the market on donkeys' backs.

Another way of carrying goods is in carts. Carts can be used only where there are roads of some kind, but they can carry heavier loads than pack animals.

Carts are often drawn by oxen. Ox-carts are slow, but they are very useful. In almost every part of the world ox-carts can be seen. In Europe they carry corn or beetroot or turnips, as they do in Africa and America, but in Ceylon they carry tea.

Horses, however, are most often used for pulling carts. And, of course, wherever horses are used there must be men who know how to look after them and feed them and drive them.

But to-day carts are used only for short distances, over difficult roads. Long journeys, in busy parts of the world, are made by motor lorries, by train and by ship.

Motor lorries carry all sorts of goods. Some of them take bricks, sand, stone and cement to the places where

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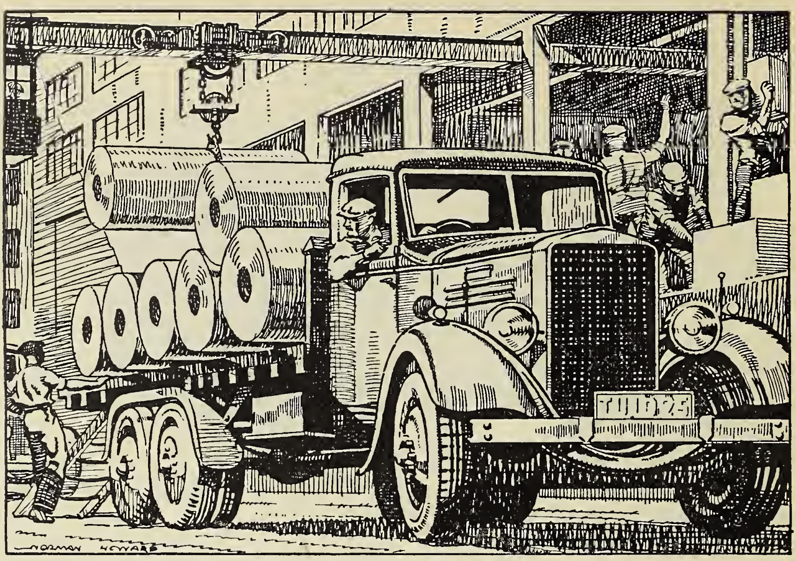
Illustration—A bullock cart (Spain).



Illustration—Unloading paper from a motor lorry.

buildings are being put up. Huge lorries with many wheels carry the long steel girders which make the framework of the building.

There are motor lorries which take fruit, vegetables and eggs from the farms to railway stations, towns and markets. Motor carriers, like huge tanks on wheels, bring milk from the country to the towns.

Motor vans of all sorts and sizes bring goods from factories and warehouses to the shops, and more motor vans carry goods away from the shops to the homes of the people who buy them.

All over the world motors carry goods from place to place. Sometimes they travel over good modern roads, or along busy streets. But in many parts they have to make their way over rough tracks and across open spaces where there are no buildings of any kind for miles and miles.

For carrying goods long distances, and for carrying

such things as coal and iron, which are very heavy, a railway is better than a road. Goods trains run in every country of the world, and for loads they carry almost everything that the world makes and uses.

There are open goods trucks loaded with coal, bricks, corn, machinery, and smaller goods packed in bales or parcels. There are special trucks made to carry great girders or long tree-trunks.

There are closed goods wagons to carry meat, cattle trucks for moving animals from place to place, special tanks built to carry oil or milk, and many other kinds as well. Every goods train is made up of many different kinds of trucks.

Each truck of a goods train is on its way from one place to another, and every now and then some of the trucks have to be changed over from one train to another, so that each truck may come to the right place as quickly as possible.

Illustration—Loading a railway train.

This work of building up trains from goods trucks is called shunting, and many men work at it. There are the men who drive the little engines which haul and push the trucks into the right places ; there are the men who work the points, so that the trucks may run on the right rails ; and there are the men who couple and uncouple the trucks.

In some places the shunting is done in a very clever way. A whole goods train is hauled up the top of a gentle slope, called a ' hump ', and its trucks are allowed one by one, to run down the slope. As each truck runs down it is guided by the points to the right place for making up the new train.

Whether goods are carried by road or by train, there must always be places, or warehouses, where they can be stored until they are wanted. And, of course, warehouses are built near the places where trains and motor lorries are loaded.

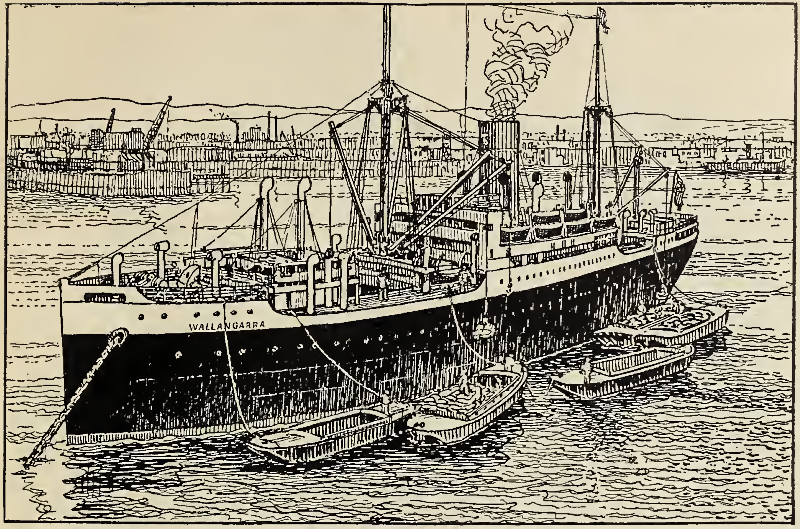
But there are journeys which cannot be made by road or by rail. Goods have to be carried across the seas, and very many men, all over the world, have to work at loading and unloading ships.

Some of the ships are huge and famous liners, which travel swiftly from country to country. But most of them are ' tramps ', whose work is to carry loads as cheaply as possible over the sea.

Docks are built so that the ships can be loaded and unloaded. A great stone wall, called a wharf, is built so that the ship can come alongside it.

There are giant cranes on the wharf, to hoist the goods from the ships' holds into the warehouses, and to load the ships with goods that are brought by rail and road to the wharves.

Every ship has great openings in its deck, called



'hatches', through which the goods are lowered into the ship's holds. Many men have to work at getting the loads ready for the cranes, and at stowing the bales and bundles away deep down in the ship.

It is not only the cranes on the wharves which hoist goods on board. Every ship has its own winches and derricks, and many things are brought aboard by the ship's own power.

Barges come alongside the ship, and great loads are hauled up and stowed away. And at the end of the ship's voyage everything has to be unloaded in the same way.

There is a great deal of work to be done at every seaport. Besides the loading and unloading, there is much to do in the warehouses. And, of course, everything that the ships carry must be brought to or from the port by road or rail.

There is one more way of carrying goods from place

Illustration—The loading of a ship.

to place, and it is the newest and quickest way of all. The great air liners which fly from country to country carry goods as well as passengers, and at the aerodromes men work at loading the goods that the aeroplanes have to carry.

But it is not very hard work to load an air liner, because the goods that they carry are light in weight. Goods are sent by air only when they must travel swiftly, and when they are so light that it does not cost too much to carry them.

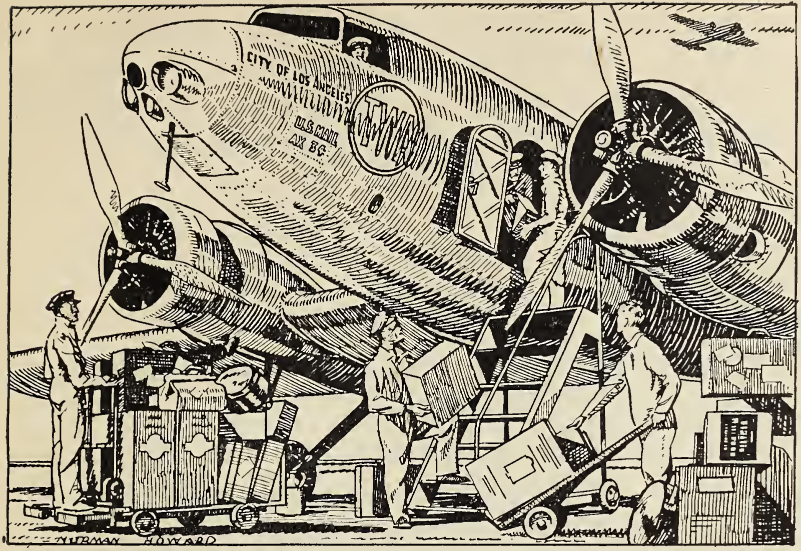
It would be quite impossible for men to work together, even in places that are only a little way apart, unless it had been arranged for the goods that are made or grown to be sent from place to place, and for people to buy and sell them.

To make sure of all this, it is important to be able to send messages as quickly as possible. And so the mails which carry letters and parcels, telephones, and telegraphs are all very important if people are to work together well.

There are people who travel from place to place, showing what the various parts of the world and their many factories have to sell, and arranging for goods to be sent to the people who wish to buy them. There are people who work at advertising, so that folk in other parts of the world may read about the goods that are for sale.

All this is the work of offices. There are offices of many different kinds in all parts of the world, and they have to deal with the hundreds of matters which make it possible for men and women to work together all over the world.

Offices have to arrange for goods to be made and



sent off. They arrange for them to be bought and sold, and for the payments and the money that is needed.

All these kinds of work are very important indeed, for without them it would be very difficult for people to work together in many parts of the world. And it is very important that messages should travel as quickly as they can.

People, too, must be able to travel quickly about the world, so that they can tell other people about the things that are being made in the world's factories, and see what is being done in other parts of the world.

And the work of carrying passengers from place to place, by road, rail, sea and air, is a great part of the world's work.

So it is that men work together, in many different countries, to make sure that in our shops we shall find

Illustration—Loading an air liner (America).

all the many things that we need and use every day of our lives. The story of the goods that we see in our shop windows tells us nearly everything about the work that men do, all over the world, as they work together.

EXERCISES

PICTURES

Page 152. Name some other pack animals, and say what you can about each.

Page 153. Name other animals which are used to draw loads in different parts of the world.

Page 154. What do you know about these great rolls of paper?

Page 155. Explain why some things are sent by goods train and some by passenger train.

Page 159. Name some things which are carried by an air liner, and some which are not. Give your reasons.

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1. Make a list of the ways in which heavy goods are carried from place to place.
2. How is a goods train made up? What is a shunter, and what is his work?
3. Show how cotton causes men to work together in the world.
4. Why is it important for messages to be sent quickly from place to place? Describe a few of the ways in which it is done.

REVISION EXERCISES

PICTURES

PAGES	
8, 14.	Find some more pictures in this book which show the different ways in which ships are loaded.
72, 123.	In what ways are these scenes alike, and in what ways are they different ? Explain the work which is done in each.
13, 52.	Find as many pictures as you can which show how goods are carried from place to place. Which of them are taken by water, which by land, and which by air ?
12, 17.	Find as many pictures as you can to show the work which has been done before the food comes to the kitchen.
15, 113, 106.	How many kinds of electric trains are shown in these pictures ? In what ways are they different from each other ? Explain why.
16.	Make a list of the pictures in this book which show how buildings are made. Make a list of the different things used for the walls of buildings.
19, 29. 100, 150.	These pictures tell different parts of the same story about work. What is the story ?
22, 100.	Look at these pictures, and then give two reasons why it is important to be able to keep food cold.
23, 75, 134.	Look carefully at the clothes worn by the people in these pictures. Make a list of the kinds of clothes you can find in the pictures of this book. Explain why they are different from each other.
13, 36.	In one of these places it is important to keep the bundles dry, and in the other, to keep them wet. Explain why.

PICTURES

PAGES	
44, 87, 144.	Tell how steel and concrete are used together in building. Can you give any reasons why they are used?
52, 103, 145.	What kinds of loads are carried on rivers and canals? Which kinds of rivers are unsuitable for this work?
54, 82.	Here are two places where things are made very hot. What is the work done in each?
23, 24.	Here are two ways of baking bread in an oven. Say what you can about them.
57.	Find other pictures which show places where this glass may be used, and explain why it is used.
62, 63, 64.	Use these three pictures to explain how the paper for this book was made. Why are there so many rollers?
65, 125.	Explain how machines and works like these help to provide work for the people shown in the pictures on pages 150 and 157.
74, 76, 77. 102, 103.	From these pictures tell some of the work which is done before electricity reaches a house.
83, 85, 86. 50, 56.	Explain some of the ways in which the things shown in these pictures are being shaped. Why are the ways different?
90, 95, 147.	Tell as many as you can of the things that have happened to this ship between the first and the last of these pictures.
104.	This picture shows one way in which water helps men in their work. Find as many pictures as you can which show other ways in which men use water in their work.
107, 150.	How do these pictures tell different parts of the same story?

PICTURES

PAGES

134. What is the great difference between the two ways of travelling you can see in this picture? Find other pictures which show the same difference.

Why is this very important for the work of the men in the pictures on pages 132 and 133?

143, 144, 146. Tell the story of the making of a road. Why are good roads very important?

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1. How many different kinds of ships and boats can you find in the pictures of this book? What is each used for?
2. Explain why people in different parts of the world have different kinds of houses, and eat different kinds of food.
3. What do we mean by tinplate? How is it made, and for what is it used?

   Make a list of the foods which we can buy in "tins."
4. Name some of the things which come from Canada and New Zealand, and some of the things which Britain sends them in return.
5. Which countries send us tea, beef, timber and rubber? Try to give reasons why they send them to us.
6. Britain buys wool from Australia. Why do we sell woollen cloth to Australia? Name some other goods we get from Australia, and explain why we buy them.
7. Which countries grow wheat? Tell the story of what happens to the wheat before it appears on our tables as bread.
8. Why must the people who make things, the people who carry them from place to place, and the people who sell them, all work together?
9. Say what you can about any famous trains or ships which are at work to-day. Why are they famous?
10. Why do we find the work of getting coal, making steel, and building ships so often done in the same countries?

11. How do men use the water in lakes to drive engines? What work may the engines be used for?

12. In what parts of the world are animals used to carry goods? Name some of the animals used.

13. When is a train more useful for a journey than a motor-car? When is a barge more useful than a liner?

14. Explain the work of the Post Office in sending letters and messages. Why are letters sometimes sent by Air Mail?

15. A railway engine needs coal and a motor-car needs petrol to drive it. Name some other ways in which engines are driven, and give examples.

16. Explain how a canal is built, and how it works. Why were canals built?

17. Goods can be carried by train, ship, motor-lorry, or aeroplane. Why are all these different kinds of transport used?

    Name other ways of carrying goods from place to place, and explain why they, too, are useful.

18. Why have men built so many railways in all parts of the world?

19. How many kinds of docks do you know? What is each used for?

20. How are messages and letters sent? Which are the quickest ways of sending messages and letters?

21. Examine this book, and make a list of the things used in making it. Then tell, as well as you can, the story of each of them.

22. Here is a list of pairs of countries. In each pair men have to work together. Explain why.

(*a*)	Britain	The Argentine
(*b*)	India	Britain
(*c*)	France	China
(*d*)	America	Malaya
(*e*)	America	Britain
(*f*)	Iraq	Britain
(*g*)	Britain	Canada
(*h*)	Sweden	Britain

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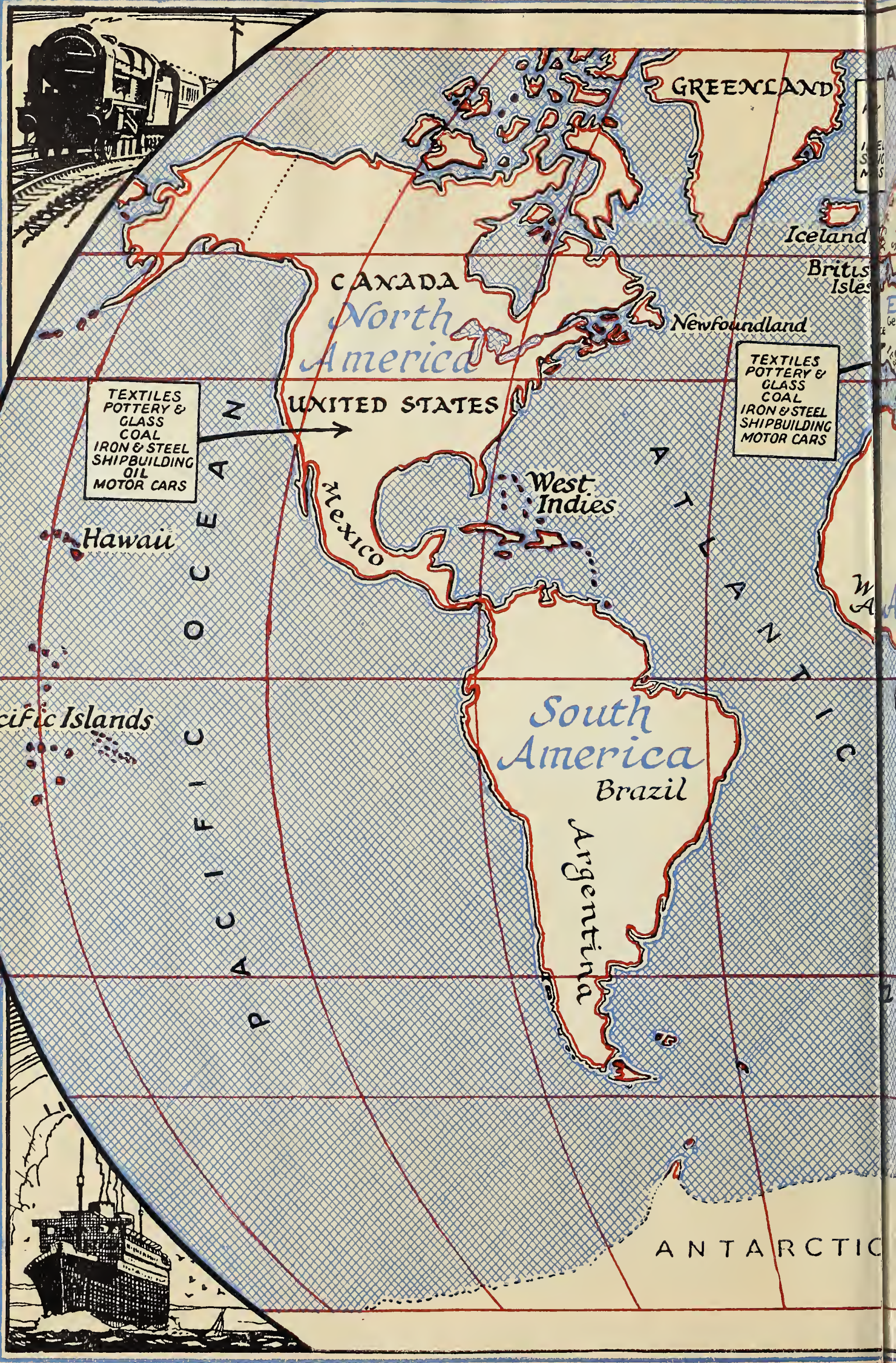
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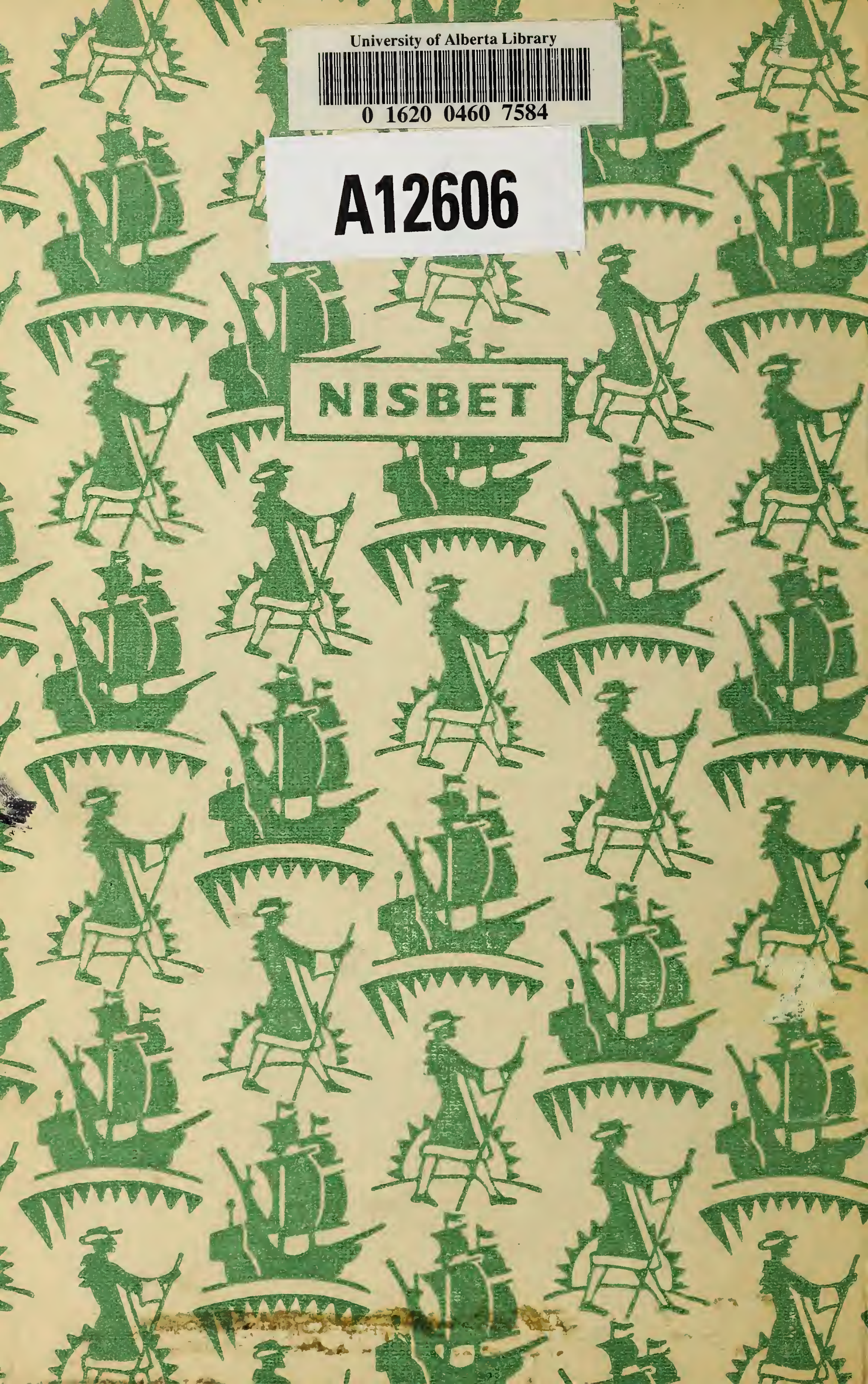

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